Shoubra Faculty of Engineering

Intended Learning Outcomes
For B.Sc Programs

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Contents

Intended Learning Outcomes (ILO's)

Introduction

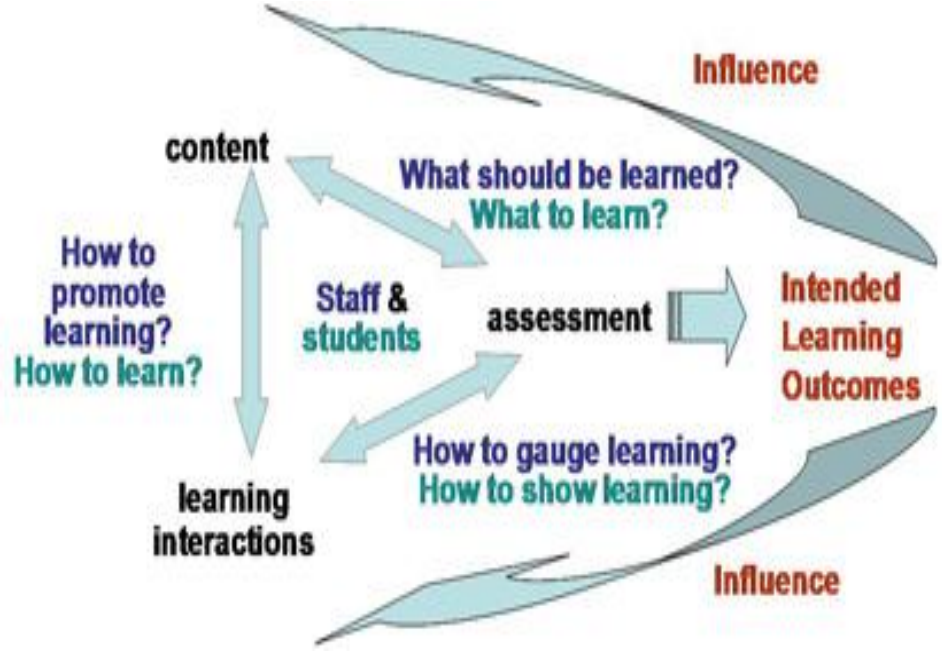
Having cleared up any confusion over outcomes, we can now look at how we create outcomes for our course. They are called **Intended Learning Outcomes (ILO's)**because in good learning environments, students also learn many additional things about the academic subject, working with others, dealing with difficult people, teamwork, and general life and learning skills which are not necessarily included in our ILO's. These are called **Unintended Learning Outcomes**.

Intended Learning Outcomes are: Statements of what **students** are expected to be able to do as a result of engaging in the learning process (studying a lecture/course/program). They are:

- Expressed from the **students' perspective**.
- Expressed in the form of **action verbs** leading to observable and assessable behavior.
- Related to criteria for **assessing** student performance.

Learning outcomes are statements of the attributes and capabilities that a student should be able to display on successful

completion of the topic. They provide the basis for determining student progress and designing assessment strategies and methods. Learning outcomes also provide signposts towards appropriate content and learning interactions.



The domain of the **Intended Learning Outcomes (ILO's)** composed of four sections. They are;

- Knowledge and understanding – subject domain
- Intellectual Skills – or the cognitive domain

- Professional Skills – or the affective domain
- Transferable Skills – or the psychomotor domain

Knowledge and understanding – subject domain

The subject domain is often conflated with the cognitive domain, which is understandable as it is within Bloom's ubiquitous taxonomy, but this does tend to confuse faculty as to the distinction between knowing and understanding a body of factual knowledge and being able to do something with that factual knowledge. The Subject domain can, and in my opinion should, be limited to defining the subject area for illustrative purposes for the student. Since the principle is that all Intended Learning Outcomes should be assessed and it is actually rather difficult to assess whether someone 'understands' something without having them 'operationalize' the knowledge, I tend not to get too hung up on the active verbs used in this domain, contenting myself it serves to contextualise what follows, but maybe I should and another post later will unpack Anderson and Krathwohl's Knowledge Dimension in more detail.

Intellectual Skills / Cognitive domain

This domain refers to ‘knowledge structures’ building from the base of the Subject domain, the “knowing the facts”, towards high order thinking skills in which these facts become operationalized and transferable. This domain is familiar to most faculty and synonymous with the work of Bloom from the 1950s (Bloom, 1984) and the useful revisions made in 2001 (Anderson & Krathwohl, 2001).

Professional Skills / Affective domain

The affective is concerned with an individual’s values, and includes their abilities with respect to self perception through to abstract empathetic reasoning. In an extension to the early work by Bloom progressive stages take the learner from foundational ‘receiving’, through to the ‘internalization’ of personal value systems (Krathwohl, Bloom, & Masia, 1999). In the context of Higher Education programmes, particularly an era when the employability of graduates is stressed, an awareness of these professional values would do well to be built into the relevant modules.

Transferable Skills / Psychomotor domain

The psychomotor domain is less well researched and documented and this has meant a less than adequate recognition and incorporation into learning designs. Frequently tactile or technical skills become seen as ‘general skills’ or ‘transferable skills’ and there is little sense of progression. This domain refers to progressively complex manual or physical skills and so could identify the progressively complex skills of a biologist in using microscopes, or an economist using a statistics software package (Dave, 1967). I find this domain unfortunately neglected as I believe it would enhance course designs if note were taken of the practical technical skills required within disciplines and their articulation in Intended Learning Outcomes.

Faculty of Engineering (Shoubra)-Benha university consists of eleven programs which are Architectural program, Computer program, Communication program, Electrical power program, Mechanical power program, Production and Mechanical design program, Survey program, Industrial Engineering program,

Energy & Sustainable Energy Engineering program, Civil (General) program and Civil (Structure) program .

Electrical Engineering (Computers) program

a. Knowledge And Understanding

Graduates will achieve an appropriate level of technical competence in demonstrates knowledge and understanding of:

a1. List the concepts and theories of mathematics and sciences, appropriate to the computer engineering field.

a2. List the basics of information and communication technology (ICT).

a3. Define characteristics of engineering materials related to the computer engineering field.

a4. Identify the principles of design including elements design, process and/or a system related to specific computer engineering field.

a5. Demonstrate the different methodologies of solving engineering problems.

a6. Define quality assurance , codes of practice and standards, health and safety requirements and environmental issues.

a7. Learn business and management principles relevant to engineering.

a8. Discover current engineering technologies as related to computer engineering field.

a9. Learn topics related to humanitarian interests and moral issues.

Learn about technical language and report writing.

a10. Link between professional ethics and socio-economical impact of engineering solutions

a11. Identify contemporary engineering topics.

a12. Identify engineering principles in the fields of logic design, circuit analysis, machine and assembly languages, computer organization and architectures, memory hierarchy, advanced computer architectures, and embedded systems, signal processing, operating systems, real-time systems and reliability analysis.

a13. Define the quality assessment of computer systems.

a14. Conduct related research and current advances in the field of computer software and hardware.

a15. Analyze technologies of data, image and graphics representation and organization on computer storage media.

a16. Explore modern trends in information technology and its fundamental role in business enterprises.

b. Intellectual Skills

The Computer Systems Engineering graduate should be able to:

b1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.

b2. Select appropriate solutions for engineering problems based on analytical thinking.

b3. Think in a creative and innovative way in problem solving and design.

b4. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

b5. Assess and evaluate the characteristics and performance of components, systems and processes.

b6. Investigate the failure of components, system, and processes.

b7. Solve engineering problems, often on the basis of limited and possibly contradicting information;

b8. Select and appraise appropriate ICT tools to a variety of engineering problems.

b9. Judge engineering decision considering balanced cost, benefits, safety, quality, reliability, and environmental impact.

b10. Incorporate economic, social, environmental dimensions and risk management in design.

b11. Analyze results of numerical models and appreciate their limitations.

b12. Create systematic and methodic approaches in dealing with new and advancing technology,

b13. Select the appropriate mathematical tools, computing methods, design techniques for modeling and analyzing computer systems.

b14. Select, synthesize, and apply suitable IT tools to computer engineering problems.

b15. Propose various computer-based solutions to business system problems cost-benefit analysis should be performed especially in sensitive domains where direct and indirect costs are involved.

b16. Identify symptoms in problematic situations.

b17. Innovate solutions based on non traditional thinking and the use of latest technologies.

b18. Capability of integrating computer objects running on different system configurations.

c. Professional And Practical Skills

The Computer Systems Engineering graduates must show ability to:

c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems

c2. Professionally merge engineering knowledge and understanding to improve design, products and/or services.

c3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

c4. Practice the neatness and aesthetics in design and approach.

c5. Use computational facilities, measuring instruments, workshops and laboratories equipment to design experiments and collect, analyze and interpret results.

c6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.

c7. Apply numerical modeling methods to engineering problems.

c8. Apply safe systems at work and observe the appropriate steps to manage risks.

c9. Demonstrates basic organizational and project management skills.

c10. Apply quality assurance procedures and follow codes and standards.

c11. Exchange knowledge and skills to engineering community and industry

c12. Prepare and present technical reports.

c13. Design and operate computer-based systems specifically designed for business applications.

c14. Use appropriate specialized computer software, computational tools and design packages throughout the phases of the life cycle of system development.

c15. Write computer programs on professional levels achieving acceptable quality measures in software development.

c16. Conduct user support activities competently.

d. General And Transferable Skills

Graduates will have an educated view of the world including:

d1. Collaborate effectively within multidisciplinary team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively.

d4. Demonstrate efficient IT capabilities.

d5. Lead and motivate individuals.

d6. Effectively manage tasks, time, and resources.

d7. Search for information and engage in life-long self-learning discipline.

d8. Acquire entrepreneurial skills.

d9. Refer to relevant literatures.

d10. Write technical reports and presentation.

d11. Share ideas and communicate with others according to the rules of professional ethics.

d12. Develop skills related to creative and critical thinking as well as problem solving.

Electrical Engineering (Communication) Program

a. Knowledge And Understanding:

a1. Define concepts and theories of mathematics, appropriate to the discipline.

a2. Define concepts and theories of sciences, appropriate to the discipline.

a3. Define basics of information and communication technology (ICT).

a4. Demonstrate characteristics of engineering materials related to discipline.

a5. Describe principles of design including elements design, process and/or a system related to specific disciplines.

a6. Demonstrate methodologies of data collection interpretation and solving engineering problems.

a7. Describe quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

a8. List the business management principles relevant to engineering.

a9. Define current engineering technologies as related to disciplines.

a10. Demonstrate topics related to humanitarian interests.

a11. Demonstrate topics related to moral issues.

a12. Define technical language and report writing.

a13. Illustrate professional ethics and impacts of engineering solutions on society and environment.

a14. Demonstrate contemporary engineering topics.

a15. Illustrate elementary science underlying electronic engineering systems.

a16. Illustrate elementary science underlying information technology.

a17. Illustrate the constraints of applying inappropriate technology and the needs of commercial risk evaluation.

a18. Mention basics of design and analyzing electronic engineering systems.

a19. Describe principles of analyzing and design of electronic circuits and components.

a20. Describe principles of analyzing and design of control systems with performance evaluation.

a21. List biomedical instrumentation.

a22. Illustrate communication systems

a23. Illustrate coding and decoding techniques.

a24. List microwave applications.

a25. Demonstrate antenna and wave propagation.

a26. Mention Methods of Nanotechnology application.

a27. Define usage of optical fiber.

a28. Mention Methods of fabrication of integrated circuits

a29. Describe analysis of signal processing.

a30. Define optical communication systems.

b. Intellectual Skills

b1. Select appropriate mathematical methods for modeling.

b2. Select appropriate computer-based methods for analyzing problems.

b3. Select appropriate solutions for engineering problems based on analytical thinking.

b4. Think in a creative and innovative way in problem solving and design.

b5. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

b6. Assess and evaluate the characteristics and performance of components, systems and processes.

b7. Investigate the failure of components, systems, and processes.

b8. Solve engineering problems, often on the basis of limited and possibly contradicting information.

b9. Select and appraise appropriate ICT tools to a variety of engineering problems.

b10. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

b11. Incorporate economic, social, environmental dimensions and risk management in design.

b12. Analyze results of numerical models and appreciate their limitations.

b13. Create systematic and methodic approaches when dealing with new and advancing technology.

b14. Develop innovative solutions for the practical industrial problems.

b15. Plan, conduct and write a report on a project or assignment.

b16. Analyze the performance of digital and analog communication systems.

b17. Analyze the performance of mobile communication, coding and decoding systems.

b18. Synthesize and integrate electronic systems for certain specific function using the right equipment.

c. Professional And Practical Skills

c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.

c2. Professionally merge the engineering knowledge, understanding, and feedback to improve design, product and/or services.

c3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

c4. Practice the neatness and aesthetics in design and approach.

c5. Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.

c6. Use a wide range of analytical tools, techniques, equipment, and

Software packages pertaining to the discipline and develop required computer programs.

c7. Apply numerical modeling methods to engineering problems.

c8. Apply safe systems at work and observe the appropriate steps to manage risks.

c9. Demonstrate basic organizational and project management skills.

c10. Apply quality assurance procedures and follow codes and standards.

c11. Exchange knowledge and skills with engineering community and industry.

c12. Prepare and present technical reports.

c13. Use appropriate mathematical methods or IT tools.

c14. Practice computer programming for the design and diagnostics of digital and analog communication systems.

c15. Practice computer programming for the design and diagnostics of mobile communication, coding and decoding systems.

c16. Use relevant laboratory equipment and analyze the results correctly.

c17. Troubleshoot, maintain and repair almost all types of electronic systems using the standard tools.

c18. Identify appropriate specifications for required devices.

c19. Use appropriate tools to measure system performance.

d. General And Transferable Skills

d1. Collaborate effectively within multidisciplinary team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively.

d4. Demonstrate efficient IT capabilities.

d5. Lead and motivate individuals.

d6. Effectively manage tasks, time, and resources.

d7. Search for information and engage in life-long self learning discipline.

d8. Acquire entrepreneurial skills.

d9. Refer to relevant literatures.

d10. Write technical reports and presentation.

d11. Share ideas and communicate with others according to the rules of professional ethics.

d12. Develop skills related to creative and critical thinking as well as problem solving

Electrical Engineering (Power) Program

a. Knowledge and Understanding

The student should be able to:

a1. Describe Concepts and theories of mathematics and sciences, appropriate to the discipline.

a2. Illustrate Basics of information and communication technology (ICT).

a3. Draw Characteristics of engineering materials related to discipline.

a4. Mention Principles of design including elements design, process and/or a system related to specific disciplines.

a5. list Methodologies of solving engineering problems, data collection interpretation.

a6. Define Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

a7. Illustrate Business and management principles relevant to engineering.

a8. Mention Current engineering technologies as related to disciplines.

a9. Define Topics related to humanitarian interests and moral issues

a10. Describe Technical language and report writing.

a11. Write professional ethics and impacts of engineering solutions on society and environment.

a12. Mention Contemporary engineering topics

a13. Illustrate Analytical and computer methods appropriate for electrical power and machines engineering.

a14. list Design methods and tools for electrical power and machines equipment and systems.

a15. Mention Principles of operation and performance specifications of electrical and electromechanical engineering systems.

a16. Define Fundamentals of engineering management.

a17. Write Basic electrical power system theory.

a18. Describe Theories and techniques for calculating short circuit, motor starting and voltage drop.

a19. Mention diverse applications of electrical equipment.

a20. Describe Logic circuits.

a21. Illustrate Basic power system design concepts for underground, cable tray, grounding and lighting systems.

a22. Mention Basics of low voltage power systems.

a23. Illustrate Principles of performing electrical systems calculations, including load flow, earthling and equipment sizing.

b. Intellectual Skills

The students should be able to

b1. choose appropriate mathematical and computer-based methods for modeling and analyzing problems.

b2. choose appropriate solutions for engineering problems based on analytical thinking

b3. analyze a creative and innovative way in problem solving and design.

b4. Conclude, exchange, and assess different ideas, views, and knowledge from a range of sources.

b5. Create and evaluate the characteristics and performance of components, systems and processes.

b6. Diagnose the failure of components, systems, and processes

b7. Analyze engineering problems, often on the basis of limited and possibly contradicting information.

b8. Choose and appraise appropriate ICT tools to a variety of engineering problems.

b9. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

b10. Implement economic, social, environmental dimensions and risk management in design.

b11. Analyze results of numerical models and appreciate their limitations.

b12. Create systematic and methodic approaches when dealing with new and advancing technology.

b13. Identify and formulate engineering problems to solve problems in the field of electrical power and machines engineering.

b14. Analyze design problems and interpret numerical data and test and examine components, equipment and systems of electrical power and machines.

b15. Implement electrical, electronic and mechanical components and equipment with transducer, actuators and controllers in creatively computer controlled systems.

b16. Analyze the performance of electrical power generation, control and distribution systems.

c. Professional and Practical Skills

The students should be able to

c1. Perform knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.

c2. Conducts professionally merge the engineering knowledge, understanding, and feedback to improve design, product and/or services.

c3. Examine and/or re-design a process, component or system, and carry out specialized engineering designs.

c4. Perform the neatness and aesthetics in design and approach.

c5. Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.

c6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer

c7. Perform numerical modeling methods to engineering problems.

c8. Perform safe systems at work and observe the appropriate steps to manage risks.

c9. Examine basic organizational and project management skills.

c10. Perform quality assurance procedures and follow codes and standards.

c11. Dissect knowledge and skills with engineering community and industry.

c12. Prepare and present technical reports.

c13. Perform experiments, as well as analyze and interpret experimental results related to electrical power and machines systems.

c14. Test and examine components, equipment and systems of electrical power and machines.

c15. Integrate electrical, electronic and mechanical components and equipment with transducers, actuators and controllers in creatively computer controlled systems.

c16. Specify and evaluates manufacturing of components and equipment related to electrical power and machines.

c17. Perform modern techniques, skills and engineering tools to electrical power and machines engineering systems

d. General Skills

The students should be able to

d1. Communicate effectively within multidisciplinary team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively.

d4. explain efficient IT capabilities.

d5. Lead and motivate individuals.

d6. Manage effectively tasks, time, and resources.

d7. Search for information and engage in life-long self learning discipline.

d8. Acquire entrepreneurial skills.

d9. Refer to relevant literatures.

Architectural Engineering Program

a. Knowledge and understanding

Graduates of the architectural engineering program will achieve an appropriate level of technical competence in Acquiring knowledge and understanding of:

a1. Recognize concepts and theories of mathematics and sciences, appropriate to Interior, Architecture, urban design and urban planning.

a2. Recognize basics of information and communication technology (ICT).

a3. Understand characteristics of engineering materials related to architecture design.

a4. Understand principles of design including elements design, process and/or a system related to Interior, Architecture, urban design and urban planning.

a5. Recognize methodologies of solving engineering problems, data collection interpretation.

a6. Define quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

a7. Name business and management principles relevant to engineering.

a8. State current engineering technologies as related to Interior, Architecture, urban design and urban planning.

a9. Define topics related to humanitarian interests and moral issues.

a10. Apply technical language and report writing.

a11. Apply professional ethics and impacts of engineering solutions on society and environment.

a12. Recognize contemporary engineering topics.

a13. Recognize principles of architectural design, and the preparation and presentations of design projects in a variety of contexts, scales, types and degree of complexity.

a14. Understand Theories and Legislations of urban and regional planning.

a15. Understand principles of building technologies, structure and construction methods, technical installations, properties of materials and the way they may influence design decisions.

a16. Understand fundamentals of building acquisition, operational costs, and of preparing construction documents and

specifications of materials, components and systems appropriate to the building.

a17. Understand the processes of spatial change in the built and natural environments; the patterns and problems of cities; and positive and negative impacts of urbanization.

a18. Understand the significance of urban spaces and the interaction between human behavior, built environment and natural environment.

a19. Identify theories and histories of architecture, planning, and urban design.

a20. Understand physical modeling, multi-dimensional visualization, multimedia applications and computer-aided design.

a21. Identify the role of the architecture profession relative to the construction industry and the overlapping interests of organizations representing the built environment.

a22. Identify principles of sustainable design, climatic considerations and energy consumption and efficiency in buildings and their impacts on the environment.

a23. Understand various dimensions of housing problem and the range of approaches, policies, and practices that could be carried out to solve this problem.

b. Intellectual skills

The architectural engineering graduate should de able to:

b1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.

b2. Select appropriate solutions for engineering problems based on analytical thinking.

b3. Think in a creative and innovative way in problem solving and design.

b4. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

b5. Assess and evaluate the characteristics and performance of components, systems and processes.

b6. Investigate the failure of components, systems, and processes.

b7. Solve engineering problems, often on the basis of limited and possibly contradicting information.

b8. Select and appraise appropriate ICT tools to a variety of engineering problems.

b9. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

b10. Incorporate economic, social, environmental dimensions and risk management in design.

b11. Analyze results of numerical models and appreciate their limitations.

b12. Create systematic and methodic approaches when dealing with new and advancing technology.

b13. Integrate different forms of knowledge, ideas from other disciplines and manage information retrieval to create new solutions

b14. Think three-dimensionally and engage images of places and times with innovation and creativity in the exploration of design

b15. Predict possible consequences, by-products and assess expected performance of design alternatives

b16. Reconcile conflicting objectives and manage the broad constituency of interests to reach optimum solutions

b17. Integrate community design parameters into design projects

b18. Appraise the spatial, aesthetic, technical and social qualities of a design within the scope and scale of a wider environment

b19. Discuss, search and formulate informed opinions appropriate to specific context and circumstances affecting architecture profession and practice.

b20. Analyze the range of patterns and traditions that have shaped and sustained cultures and the way that they can inform design process

b21. Integrate relationship of structure, building materials and construction elements into design process

c. Practical and Professional skills

The architectural engineering graduates must show ability to:

c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.

c2. Professionally merge the engineering knowledge, understanding, and feedback to improve design, product and/or services.

c3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

c4. Practice the neatness and aesthetics in design and approach.

c5. Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.

c6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.

c7. Apply numerical modeling methods to engineering problems.

c8. Apply safe systems at work and observe the appropriate steps to manage risks.

c9. Demonstrate basic organizational and project management skills.

c10. Apply quality assurance procedures and follow codes and standards.

c11. Exchange knowledge and skills with engineering community and industry.

c12. Prepare and present technical reports.

c13. Produce and present architectural, urban design and planning projects using an appropriate range of visual, verbal and written media, and designed-based software.

c14. Participate professionally in managing construction processes;

c15. Demonstrate problems; professional competence in developing innovative and appropriate solutions of architecture and urban problems.

c16. Display imagination and creativity.

c17. Respect all alternative solutions; changes in original plan of the project, differences in style, culture, experience and treat others with respect.

c18. Provide leadership and education to the client particularly with reference to sustainable design principles.

c19. Respond effectively to the broad constituency of interests with consideration of social and ethical concerns.

c20. Contribute positively to the aesthetic, architecture and urban identity, and cultural life of the community.

c21. Produce professional workshop and technical drawings using traditional drawing and computer-aided drawings' techniques.

c22. Use appropriate construction techniques and materials to specify and implement different designs.

d. **General and transferable skills**

Graduates will have an educated view of the world including:

d1. Collaborate effectively within multidisciplinary team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively.

d4. Demonstrate efficient IT capabilities.

d5. Lead and motivate individuals.

d6. Manage effectively tasks, time, and resources.

d7. Search for information and engage in life-long self learning discipline.

d8. Acquire entrepreneurial skills.

d9. Refer to relevant literatures.

Surveying Engineering Program

a. Knowledge and understanding:

The graduate will be able to:

a1. Understand concepts and theories of mathematics and sciences, appropriate to the discipline.

a2. Be familiar with basics of information and communication technology (ICT).

a3. Know characteristics of engineering materials related to discipline.

a4. Recognize principles of design including elements design, process and/or a system related to specific disciplines.

a5. Understand methodologies of solving engineering problems, data collection interpretation.

a6. Be aware of quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

a7. Know business and management principles relevant to engineering.

a8. Be familiar with current engineering technologies as related to disciplines.

a9. Recognize topics related to humanitarian interests and moral issues.

a10. Be familiar with technical language and report writing.

a11. Be aware of professional ethics and impacts of engineering solutions on society and environment.

a12. Know contemporary engineering topics.

a13. Be aware of basic laws, concepts, theories and principles of all surveying fields, and understanding of other scientific fields, e.g., photo chemistry, computer science, earth and environmental sciences, mapping science etc.

a14. Know methodologies of data collection and interpretation from maps and images (satellite and airborne).

a15. Recognize applications of all new and advanced surveying techniques, e.g., remote sensing, photogrammetry, GPS and GIS, navigation and aviation in all surveying tasks.

a16. Be familiar with technologies of data gathering from field, maps and images, and their graphical representation and organization on computer storage media, and their important role for decision making.

b. Intellectual Skills:

The graduate will be able to:

b1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.

b2. Select appropriate solutions for engineering problems based on analytical thinking.

b3. Think in a creative and innovative way in problem solving and design.

b4. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

b5. Assess and evaluate the characteristics and performance of components, systems and processes.

b6. Investigate the failure of components, systems, and processes.

b7. Solve engineering problems, often on the basis of limited and possibly contradicting information.

b8. Select and appraise appropriate ICT tools to a variety of engineering problems.

b9. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

b10. Incorporate economic, social, environmental dimensions and risk management in design.

b11. Analyze results of numerical models and appreciate their limitations.

b12. Create systematic and methodic approaches when dealing with new and advancing technology.

b13. Handling multiple projects, working under pressure and ensuring adequate quality on product and services provided.

b14. Integrate different surveying techniques for increasing the accuracy of surveying results.

b15. Interpret different kinds of maps and images for economic, social, environmental and military purposes.

b16. Exchange information with other people in the organization and make surveying data useful for community.

b17. Adopt, create and innovate thinking for solving problems of surveying engineering.

c. Professional and practical skills:

The graduate will be able to:

c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.

c2. Merge professionally the engineering knowledge, understanding, and feedback to improve design, product and/or services.

c3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

c4. Practice the neatness and aesthetics in design and approach.

c5. Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.

c6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.

c7. Apply numerical modeling methods to engineering problems.

c8. Apply safe systems at work and observe the appropriate steps to manage risks.

c9. Demonstrate basic organizational and project management skills.

c10. Apply quality assurance procedures and follow codes and standards.

c11. Exchange knowledge and skills with engineering community and industry.

c12. Prepare and present technical reports.

c13. Maintain, check and repair what is possible of surveying instruments before using it properly in the field.

c14. Use competent surveying laboratory and field instruments safely.

c15. Practice professionally surveying management skills and prepare data field notebook, technical drafts and reports.

c16. Execute all kinds of surveying related works using the appropriate surveying instruments, techniques and mapping software.

c17. Perform spatial analysis using GIS and CAD technology.

c18. Work with GPS data, lidar data, conventional survey field notes, parcel mapping, Land Titles, and ortho-rectified aerial/satellite imagery.

c19. Record the data in the field and office in a proper way.

c20. Use the internet and self study.

d. General and transferable skills:

The graduate will be able to:

d1. Collaborate effectively within multidisciplinary team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively.

d4. Demonstrate efficient IT capabilities.

d5. Lead and motivate individuals.

d6. Manage effectively tasks, time, and resources.

d7. Search for information and engage in life-long self learning discipline.

d8. Acquire entrepreneurial skills.

d9. Refer to relevant literatures.

NARS Mechanical Power Engineering

a. Knowledge and understanding:

New	old	item
1	1	a1. Concepts and theories of mathematics and sciences, appropriate to mechanical engineering.
2	2	a2. Basics of information and communication technology providing support for mechanical power and energy engineers.
3	3	a3. Characteristics and properties of materials relevant to mechanical engineering applications.
4	4	a4. Principles of design including elements design, process and/or a system and their applications to mechanical and energy engineering.
5	5	a5. Methodologies of solving engineering problems, data collection and interpretation.
6	6	a6. Quality assurance systems, codes of practice and Standards, health and safety requirements and environmental issues.

7	8,12	a7. Current engineering topics and technologies as related to mechanical power and energy engineers.
8	11	a8. Professional ethics and impacts of engineering solutions on society and environment
9	13	a9. Fundamentals, concepts, principles and theories relevant to thermal and fluid processes
10	14	a10. Internal combustion, pumps, turbines, and compressors classification, construction, design concepts, operation and characteristics.
11	15	a11. Fluid power systems.
12	16	a12. The constraints which mechanical power and energy engineers have to judge to reach at an optimum solution.
13	17	a13. Business and management techniques and practices appropriate to mechanical power and energy engineering applications
14	18	a14. Mechanical power and energy engineering contemporary issues
15	19	a15. Basic theories and principles of some other engineering and mechanical engineering disciplines

		providing support to mechanical power and energy disciplines.

b. Intellectual Skills:

New	old	item
1	1	b1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.
2	3	b2. Think in a creative and innovative way in solving engineering problems and design mechanical power and energy systems and components.
3	4	b3. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.
4	5	b4. Assess and evaluate the characteristics and performance of components, systems and processes.
5	7	b5. Solve engineering problems, often on the basis of limited and possibly contradicting information.
6	9	b6. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability,

		and environmental impact.
7	10	b7. Incorporate economic, social, environmental dimensions and risk management in design.
8	11	b8. Analyze results of numerical models and appreciate their limitations.
9	12	b9. Create systematic and methodic approaches when dealing with new and advancing technology.
10	13	b10. Evaluate mechanical power and energy engineering design, processes and performances and propose improvements.
11	14	b11. Analyze and interpret data, and design experiments to obtain new data.
12	15	b12. Evaluate the power losses in the fluid transmission lines and networks.
13	16	b13. Analyze the performance of the basic types of internal combustion engines, hydraulic machines.
14	17	b14. Analysis of fluid power systems, subsystems and various control valves and actuators.

c. Professional and practical skills:

New	old	item
1	1	c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.
2	5	c2. Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.
3	7	c3. Apply numerical modeling methods to engineering problems.
4	8	c4. Apply safe systems at work and observe the appropriate steps to manage risks.
5	9	C5.Demonstrate basic organizational and project management skills.
6	10	c6. Apply quality assurance procedures and follow codes and standards.
7	11	c7. Exchange engineering knowledge and skills with engineering community and industry to improve design, product and/or services.
8	13	c8. Use basic workshop equipment safely and

		appropriately.
9	14	c9. Prepare engineering drawings, computer graphics and specialized technical reports.
10	15	c10. Write computer programs pertaining to mechanical power and energy engineering.
11	16	c11. Describe the basic thermal and fluid processes mathematically and use the computer software/ develop required computer programs for their simulation and analysis.
12	17	c12. Design, operate, repair and maintain hydraulic power systems for diverse applications.
13	18	c13. Carry out preliminary designs of fluid transmission networks, internal combustion and steam engines and solve their operational problems.
14	19	c14. Work in mechanical power and energy operations, maintenance and overhaul.

d General and transferable skills:

New	old	item
1	1,3	d1. Collaborate and Communicate effectively within multidisciplinary team.
2	2	d2. Work in stressful environment and within constraints.
3	4	d3. Demonstrate efficient IT capabilities.
4	5	d4. Lead and motivate individuals.
5	6	d5. Manage effectively tasks, time, and resources.
6	7	d6. Search for information and engage in life-long self-learning discipline.
7	8	d7. Acquire entrepreneurial skills.
8	9	d8. Refer to relevant literatures.

Mechanical Power Engineering Program ILO's

a. Knowledge and understanding:

	item	NARS
1	a1. State the concepts and theories of mathematics and sciences, appropriate to mechanical engineering.	1
2	a2. Identify the basics of information and communication technology providing support for mechanical power and energy engineers.	2
3	a3. Illustrate the characteristics and properties of materials relevant to mechanical engineering applications.	3
4	a4. Identify the principles of design including elements design, process and/or a system and their applications to mechanical and energy engineering.	4
5	a5. Recognize the methodologies of solving engineering problems, data collection and interpretation.	5
6	a6. Identify quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.	6
7	a7. Represent current engineering topics and technologies	7

	as related to mechanical power and energy engineers.	
8	a8. Write the professional ethics and the impacts of engineering solutions on society and environment	8
9	a9. Summarize the fundamentals, concepts, principles and theories relevant to thermal and fluid processes	9
10	a10. Illustrate the classifications, construction, design concepts, operation and characteristics of internal combustion, pumps, turbines, compressors, and fluid power systems, …etc.	10,11
11	a11. State the constraints which mechanical power and energy engineers have to judge to reach at an optimum solution.	12
12	a12. List the business and management techniques and practices appropriate to mechanical power and energy engineering applications	13
13	a13. Represent the mechanical power and energy engineering contemporary issues	14
14	a14. Identify the basic theories and principles of some other engineering and mechanical engineering disciplines providing support to mechanical power and energy	15

	disciplines.	

b. Intellectual Skills:

	item	NARS
1	b1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.	1
2	b2. Think in a creative and innovative way in solving engineering problems and design mechanical power and energy systems and components.	2
3	b3. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.	3
4	b4. Assess and evaluate the characteristics and performance of components, systems and processes.	4
5	b5. Solve engineering problems, often on the basis of limited and possibly contradicting information.	5
6	b6. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.	6
7	b7. Incorporate economic, social, environmental	7

	dimensions and risk management in design.	
8	b8. Analyze results of numerical models and appreciate their limitations.	8
9	b9. Create systematic and methodic approaches when dealing with new and advancing technology.	9
10	b10. Evaluate mechanical power and energy engineering design, processes and performances and propose improvements.	10
11	b11. Analyze and interpret data, and design experiments to obtain new data.	11
12	b12. Evaluate the power losses in the fluid transmission lines and pipes networks.	12
13	b13. Analyze the performance of the basic types of internal combustion engines, hydraulic machines, heat transfer equipment, fluid power systems, subsystems and various control valves and actuators.	13,14

c. Professional and practical skills:

	item	NARS
1	c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.	1
2	c2. Use computational facilities and techniques, collect, analyze, and interpret results.	2
3	c3. Apply numerical modeling methods to engineering problems.	3
4	c4. Use measuring instruments, workshops and laboratories equipment to design experiments	2
5	c5. Apply safe systems at work and observe the appropriate steps to manage risks.	4
6	c6. Demonstrate basic organizational and project management skills.	5
7	c7. Apply quality assurance procedures and follow codes and standards.	6
8	c8. Exchange engineering knowledge and skills with	7

	engineering community and industry to improve design, product and/or services.	
9	c9. Use basic workshop equipment safely and appropriately.	8
10	c10. Prepare and present engineering drawings, computer graphics and specialized technical reports.	9
11	c11. Develop required computer programs pertaining to mechanical power and energy engineering applications.	10
12	c12. Describe the basic thermal and fluid processes mathematically and use the computer software	11
13	c13. Carry out preliminary designs of hydraulic power systems, fluid transmission networks, internal combustion and steam engines and solve their operational problems.	12,13
14	c14. Work in mechanical power and energy operations, maintenance and overhaul.	14

d. General and transferable skills:

		NARS
1	d1. Collaborate and Communicate effectively within multidisciplinary team.	1,3
2	d2. Work in stressful environment and within constraints.	2
3	d3. Demonstrate efficient IT capabilities.	4
4	d4. Lead and motivate individuals.	5
5	d5. Manage Effectively tasks, time, and resources.	6
6	d6. Search for information and engage in life-long self-learning discipline.	7
7	d7. Acquire entrepreneurial skills.	8
8	d8. Refer to relevant literatures.	9

Production and Mechanical Design Program

a. Knowledge and understanding:

Graduates of the **production and mechanical design program** will achieve an appropriate level of technical competence in Acquiring knowledge and understanding of:

1. State the Concepts and theories of mathematics and sciences, appropriate to the discipline.

a2. Identify the basics of information and communication technology (ICT).

a3. Illustrate the characteristics of engineering materials related to discipline.

a4. Identify the principles of design including elements design, process and/or a system related to specific disciplines.

a5. Represent current engineering methodologies of solving engineering problems, data collection interpretation.

a6. Identify quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

a7. Represent current engineering business and management principles relevant to engineering.

a8. Represent current engineering technologies as related to disciplines.

a9. Identify topics related to humanitarian interests and moral issues.

a10. Use technical language and report writing.

a11. Write the professional ethics and impacts of engineering solutions on society and environment.

a12. Assess contemporary engineering topics.

a13. State the concepts, principles and theories relevant to mechanical engineering and manufacture;

a14. State the constraints within which his/her engineering judgment will have to be exercised;

a15. List the specifications, programming and range of application of CAD and CAD/CAM facilities

a16. Represent relevant contemporary issues in mechanical engineering.

a17. Identify the basic electrical, control and computer engineering subjects related to the discipline

a18. Illustrate the role of information technology in providing support for mechanical engineers

a19. Identify engineering design principles and techniques.

a20. Represent management and business techniques and practices appropriate.

b. Intellectual skills

The Mechanical engineering graduate should de able to:

b1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.

b2. Select appropriate solutions for engineering problems based on analytical thinking.

b3. Think in a creative and innovative way in problem solving and design.

b4. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

b5. Assess and evaluate the characteristics and performance of components, systems and processes.

b6. Investigate the failure of components, systems, and processes.

b7. Solve engineering problems, often on the basis of limited and possibly contradicting information.

b8. Select and appraise appropriate ICT tools to a variety of engineering problems.

b9. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

b10. Incorporate economic, social, environmental dimensions and risk management in design.

b11. Analyze results of numerical models and appreciate their limitations.

b12. Create systematic and methodic approaches when dealing with new and advancing technology.

b13. Apply the principles of mathematics, science and technology in problem solving scenarios in mechanical engineering;

b14. Analyze and interpret data, and design experiments to obtain primary data.

b15. Evaluate and appraise designs, processes and products, and propose improvements;

b16. Interpret numerical data and apply analytical methods for engineering design purposes

b17. Use the principles of engineering science in developing solutions to practical mechanical engineering problems.

b18. Select appropriate manufacturing method considering design requirements.

c. Practical and Professional skills

The mechanical engineering graduates must show ability to:

c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.

c2. Merge professionally the engineering knowledge, understanding, and feedback to improve design, product and/or services.

c3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

c4. Practice the neatness and aesthetics in design and approach.

c5. Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.

c6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.

c7. Apply numerical modeling methods to engineering problems.

c8. Apply safe systems at work and observe the appropriate steps to manage risks.

c9. Demonstrate basic organizational and project management skills.

c10. Apply quality assurance procedures and follow codes and standards.

c11. Exchange knowledge and skills with engineering community and industry.

c12. Prepare and present technical reports.

c13. Prepare engineering drawings, computer graphics and specialized technical reports and communicate accordingly.

c14. Employ the traditional and modern CAD and CAD/CAM facilities in design and production processes

c15. Use basic workshop equipment safely;

c16. Analyze experimental results and determine their accuracy and validity;

c17. Use laboratory equipment and related computer software;

c18. Operate and maintain mechanical equipment.

c19. Prepare the process plan for manufacturing.

d. General and transferable skills

Graduates will have an educated view of the world including:

d1. Collaborate effectively within multidisciplinary team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively.

d4. Demonstrate efficient IT capabilities.

d5. Lead and motivate individuals.

d6. Manage effectively tasks, time, and resources.

d7. Search for information and engage in life-long self learning discipline.

d8. Acquire entrepreneurial skills.

d9. Refer to relevant literatures.

Industrial Engineering Program

a. Knowledge and understanding:

Graduates of the **industrial engineering program** should be able to achieve an appropriate level of technical competence in Acquiring knowledge and understanding of:

a1. State the concepts and theories of mathematics and sciences, appropriate to the discipline.

a2. Identify the basics of information and communication technology (ICT)

a3. Illustrate the characteristics of engineering materials related to the discipline.

a4. Identify the principles of design including elements design, process and/or a system related to specific disciplines.

a5. Represent current engineering methodologies of solving engineering problems, data collection and interpretation

a6. Identify quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

a7. Represent current engineering business and management principles relevant to engineering.

a8. Represent Current engineering technologies as related to disciplines.

a9. Identify topics related to humanitarian interests and moral issues.

a10. Use technical language and report writing.

a11. Write the professional ethics and impacts of engineering solutions on society and environment.

a12. Assess contemporary engineering topics.

a13. Identify the fundamental manufacturing processes and the most recent technologies that are used in that field. In addition to the most important materials used in industry, their structure, and their modes of failure.

a14. Identify the basics of Basics of industrial engineering such as production planning and control, production scheduling, and inventory management.

a15. Organize their internal structures and their management, including the management of human resources, financial resources and operations.

a16. Identify the globalization and its effect on the different operations of an organization and the importance of industrial data systems in that regard.

a17. State the key concepts of quality engineering and reliability and their importance in the production of goods and services.

b. Intellectual Skills

The graduates of the industrial engineering programs should be able to:

b1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.

b2. Select appropriate solutions for engineering problems based on analytical thinking.

b3. Think in a creative and innovative way in problem solving and design.

b4. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

b5. Assess and evaluate the characteristics and performance of components, systems and processes.

b6. Investigate the failure of components, systems, and processes.

b7. Solve engineering problems, often on the basis of limited and possibly contradicting information.

b8. Select and appraise appropriate ICT tools to a variety of engineering problems.

b9. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

b10. Incorporate economic, societal, environmental dimensions and risk management in design.

b11. Analyze results of numerical models and assess their limitations.

b12. Create systematic and methodic approaches when dealing with new and advancing technology.

b13. Solve a wide range of problems related to the analysis, design, and construction of production systems.

b14. Identify a range of solutions and critically evaluate and justify proposed design solutions.

b15. Analyze and solve the problems presented by industrial entities.

c. Practical & Professional Skills

The graduates of the industrial engineering programs should be able to:

c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve engineering problems.

c2. Merge Professionally the engineering knowledge, understanding, and feedback to improve design, products and/or services.

c3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

c4. Practice the neatness and aesthetics in design and approach.

c5. Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.

c6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.

c7. Apply numerical modeling methods to engineering problems.

c8. Apply safe systems at work and observe the appropriate steps to manage risks.

c9. Demonstrate basic organizational and project management skills.

c10. Apply quality assurance procedures and follow codes and standards.

c11. Exchange knowledge and skills with engineering community and industry.

c12. Prepare and present technical reports.

c13. Use the scientific literature effectively and make discriminating use of Web resources.

c14. Use appropriate computer-based support tools for problem-solving and analysis of results.

c15. Apply the acquired skills in a commercial or industrial environment.

d. General and Transferable Skills

The graduates of the engineering programs should be able to:

d1. Collaborate effectively within multidisciplinary team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively.

d4. Demonstrate efficient IT capabilities.

d5. Lead and motivate individuals.

d6. Manage effectively tasks, time, and resources.

d7. Search for information and engage in life-long self learning discipline.

d8. Acquire entrepreneurial skills.

d9. Refer to relevant literatures.

Energy & Sustainable Energy Engineering Program

a. Knowledge and understanding:

Graduates of the Energy and Sustainable Energy Engineering program will achieve an appropriate level of technical competence in Acquiring knowledge and understanding of:

a1. State the concepts and theories of mathematics and sciences, appropriate to the discipline.

a2. Identify the basics of information and communication technology (ICT)

a3. Illustrate the characteristics of engineering materials related to the discipline.

a4. Identify the principles of design including elements design, process and/or a system related to specific disciplines.

a5. Represent current engineering methodologies of solving engineering problems.

a6. Write the professional ethics and socio-economical impacts of engineering solutions

a7. Represent Current engineering technologies as related to disciplines.

a8. Identify quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

a9. Represent current engineering business and management principles relevant to engineering.

a10. Assess Contemporary engineering topics.

a11. Identify topics related to humanitarian interests and moral issues.

a12. Asses the impact of engineering solutions in a global and societal context;

a13. Identify the basic laws, concepts, theories and principles of all surveying fields, and understanding of other scientific fields, e.g., photo chemistry, computer science, earth and environmental sciences, mapping science etc.

a14. Select appreciation of the wider multidisciplinary engineering context and its underlying principles.

a15. Appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgment.

a16. Make the opportunity to take courses from outside of the engineering subject area which reinforce the social, environmental, ethical, economic and commercial considerations.

a17. Use technical language and report writing.

b. Intellectual skills

The Energy and Sustainable Energy Engineering program graduate should be able to:

b1. Select appropriate mathematical and computer-based methods for modelling and analyzing problems.

b2. Design and/or create a process, component or system to meet specific needs, applying appropriate knowledge and principles

b3. Select appropriate solutions for engineering problems based on analytical thinking

b4. Adopt creative and innovative thinking in solving problems, and in designing products, systems, components and processes;

b5. Consider the applicability, economy and risk management in design.

b6. Assess and evaluate effectively the characteristics and performance of components, systems and processes

b7. Demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs, often on the basis of limited and possibly contradicting information.

b8. Analyze results of numerical models and appreciate their limitations.

b9. Maintain a systematic and methodical approach in dealing with new and advancing technology,

b10. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

b11. Analyze systems, processes and components critically.

b12. Assess risks, and take appropriate steps to manage those risks.

b13. Select and appraise appropriate ICT tools to a variety of engineering problems.

b14. Create new engineering components and processes through the synthesis of ideas from a range of sources.

b15. Use computational tools and software packages pertaining to the discipline and develop required computer programs;

b16. Applied and assessed in all courses across all years of all Energy and Sustainable Energy Engineering program.

b17. Incorporate economic, social, environmental dimensions and risk management in design.

c. Practical and Professional Skills

The Energy and Sustainable Energy Engineering program graduate must show ability to:

c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems

c2. Employ computational facilities, measuring instruments, workshops and laboratories equipment to design experiments and collect, analyse and interpret results.

c3. Use a wide range of analytical and technical tools, techniques and equipment, including pertinent software;

c4. Merge engineering knowledge and understanding to improve design, products and/or services.

c5. Carry out specialized engineering designs.

c6. Apply numerical modelling methods and/or appropriate computational techniques to engineering problems

c7. Implement comprehensive engineering knowledge and understanding and intellectual skills in projects

c8. Commercialize knowledge and skills to engineering community and industry

c9. Apply safe systems at work and observe the appropriate steps to manage risks.

c10. Prepare and present technical material.

c11. Demonstrate basic organizational and project management skills.

c12. Appreciate the neatness and aesthetics in design and approach.

c13. Exchange knowledge and skills with engineering community and industry.

c14. Design and perform experiments, as well as analyze and interpret experimental results related to electrical power and machines systems.

c15. Develop workshop skills in the engineering applications program in second and third year, and the strip-and-build exercises in Mechanical Engineering.

c16. Evidence of group working and of participation in a major project is expected

d. General and transferable skills

Graduates will have an educated view of the world include

d1. Collaborate effectively within multidisciplinary team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively.

d4. Demonstrate efficient IT capabilities.

d5. Lead and motivate individuals.

d6. Manage tasks and resources efficiently.

d7. Search for information and adopt life-long self learning.

d8. Acquire entrepreneurial skills.

d9. Refer to relevant literature effectively,

d10. Develop transferable skills that will be of value in a wide range of situations.

Civil Engineering (General) Program

a. Knowledge and understanding:

Upon completion of the program the graduates of the civil engineering program (General) should be able to:

a1. Understand concepts and theories of mathematics and sciences, appropriate to the discipline.

a2. Acquire basics of information and communication technology (ICT).

a3. Understand characteristics of engineering materials related to discipline.

a4. Understand principles of design including elements design, process and/or a system related to specific disciplines.

a5. Gain knowledge of methodologies of solving engineering problems, data collection interpretation.

a6. Gain knowledge of quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

a7. Acquire business and management principles relevant to engineering.

a8. Comprehend current engineering technologies as related to disciplines.

a9. Gain knowledge of topics related to humanitarian interests and moral issues.

a10. Acquire technical language and report writing.

a11. Understand professional ethics and impacts of engineering solutions on society and environment.

a12. Gain knowledge of contemporary engineering topics.

a13. Understand engineering principles in the fields of reinforced concrete and metallic structures analysis and design, geo-techniques, and foundations, hydraulics and hydrology, water resources, environmental and sanitary engineering, roadways and traffic systems, surveying and photogrammetry.

a14. Gain knowledge of properties, behavior and fabrication of building materials.

a15. Gain knowledge of projects and construction management including planning, finance, bidding and contracts.

b. Intellectual skills

Upon completion of the program of civil engineering graduate should be able to:

b1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.

b2. Select appropriate solutions for engineering problems based on analytical thinking.

b3. Think in a creative and innovative way in problem solving and design.

b4. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

b.5. Assess and evaluate the characteristics and performance of components, systems and processes.

b6. Investigate the failure of components, systems, and processes.

b7. Solve engineering problems, often on the basis of limited and possibly contradicting information.

b8. Select and appraise appropriate ICT tools to a variety of engineering problems.

b9. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

b10. Incorporate economic, social, environmental dimensions and risk management in design.

b11. Analyze results of numerical models and appreciate their limitations.

b12. Create systematic and methodic approaches when dealing with new and advancing technology.

b13. Select appropriate building materials from the perspective of strength, durability, suitability of use to location, temperature, weather conditions and impacts of seawater and environment.

b14. Select and design adequate water control structures, irrigation and water networks, sewerage systems and pumping stations.

b15. Analyze and select codes of practices in designing reinforced concrete and metallic structures of all types. Determine the levels, types and design systems of building foundations, tunnels and excavations.

b16. Define, plan, conduct and report management techniques.

b17. Assess and evaluate different techniques and strategies for solving engineering problems.

c. Practical and Professional skills

Upon completion of the program of civil engineering graduate should be able:

c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.

c2. Merge Professionally the engineering knowledge, understanding, and feedback to improve design, product and/or services.

c3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

c4. Practice the neatness and aesthetics in design and approach.

c5. Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.

c6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs

c7. Apply numerical modeling methods to engineering problems.

c8. Apply safe systems at work and observe the appropriate steps to manage risks.

c9. Demonstrate basic organizational and project management skills.

c10. Apply quality assurance procedures and follow codes and standards.

c11. Exchange knowledge and skills with engineering community and industry.

c12. Prepare and present technical reports.

c13. Use laboratory and field equipment competently and safely.

c14. Observe record and analyze data in laboratory and in the field.

c15. Practice professionally construction management skills. Prepare technical draft and detailed drawings both manually and using CAD.

c16. Carry out maintenance of all type of roadways and traffic systems.

c17. Prepare quantity surveying reports.

c18. Plan, design, construct, operate, control and carry out maintenance of all types of roadways and traffics.

d. General and transferable skills

Upon compilation of the program of civil engineering graduate should be able to:

d1. Collaborate effectively within multidisciplinary team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively.

d4. Demonstrate efficient IT capabilities.

d5. Lead and motivate individuals.

d6. Manage Effectively tasks, time, and resources.

d7. Search for information and engage in life-long self learning discipline.

d8. Acquire entrepreneurial skills.

d9. Refer to relevant literatures.

Civil Engineering (Structure) Program

a. Knowledge and understanding:

Graduates of the Civil Engineering program (Structure) will achieve an appropriate level of technical competence in Acquiring knowledge and understanding of:

a1. Understand concepts and theories of mathematics and sciences, appropriate to the discipline.

a2. Acquire basics of information and communication technology (ICT).

a3. Understand characteristics of engineering materials related to discipline.

a4. Understand principles of design including elements design, process and/or a system related to specific disciplines.

a5. Gain knowledge of methodologies of solving engineering problems, data collection interpretation.

a6. Gain knowledge of quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

a7. Acquire business and management principles relevant to engineering.

a8. Comprehend current engineering technologies as related to disciplines.

a9. Gain knowledge of topics related to humanitarian interests and moral issues.

a10. Acquire technical language and report writing.

a11. Understand professional ethics and impacts of engineering solutions on society and environment.

a12. Gain knowledge of contemporary engineering topics.

a13. Understand engineering principles in the fields of reinforced concrete and metallic structures analysis and design, geo-techniques, and foundations, hydraulics and hydrology, water resources, environmental and sanitary engineering, roadways and traffic systems, surveying and photogrammetry.

a14. Gain knowledge of properties, behavior and fabrication of building materials.

a15. Gain knowledge of projects and construction management including planning, finance, bidding and contracts.

b. Intellectual skills

Upon completion of the program of civil engineering graduate should be able to:

b1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.

b2. Select appropriate solutions for engineering problems based on analytical thinking.

b3. Think in a creative and innovative way in problem solving and design.

b4. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

b.5. Assess and evaluate the characteristics and performance of components, systems and processes.

b6. Investigate the failure of components, systems, and processes.

b7. Solve engineering problems, often on the basis of limited and possibly contradicting information.

b8. Select and appraise appropriate ICT tools to a variety of engineering problems.

b9. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

b10. Incorporate economic, social, environmental dimensions and risk management in design.

b11. Analyze results of numerical models and appreciate their limitations.

b12. Create systematic and methodic approaches when dealing with new and advancing technology.

b13. Select appropriate building materials from the perspective of strength, durability, suitability of use to location, temperature, weather conditions and impacts of seawater and environment.

b14. Select and design adequate water control structures, irrigation and water networks, sewerage systems and pumping stations.

b15. Analyze and select codes of practices in designing reinforced concrete and metallic structures of all types. Determine the levels, types and design systems of building foundations, tunnels and excavations.

b16. Define, plan, conduct and report management techniques.

b17. Assess and evaluate different techniques and strategies for solving engineering problems.

c. Practical and Professional skills

Upon completion of the program of civil engineering graduate should be able:

c1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.

c2. Merge Professionally the engineering knowledge, understanding, and feedback to improve design, product and/or services.

c3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

c4. Practice the neatness and aesthetics in design and approach.

c5. Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.

c6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs

c7. Apply numerical modeling methods to engineering problems.

c8. Apply safe systems at work and observe the appropriate steps to manage risks.

c9. Demonstrate basic organizational and project management skills.

c10. Apply quality assurance procedures and follow codes and standards.

c11. Exchange knowledge and skills with engineering community and industry.

c12. Prepare and present technical reports.

c13. Use laboratory and field equipment competently and safely.

c14. Observe record and analyze data in laboratory and in the field.

c15. Practice professionally construction management skills. Prepare technical draft and detailed drawings both manually and using CAD.

c16. Carry out maintenance of all type of roadways and traffic systems.

c17. Prepare quantity surveying reports.

c18. Plan, design, construct, operate, control and carry out maintenance of all types of roadways and traffics.

d. General and transferable skills

Upon compilation of the program of civil engineering graduate should be able to:

d1. Collaborate effectively within multidisciplinary team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively.

d4. Demonstrate efficient IT capabilities.

d5. Lead and motivate individuals.

d6. Manage effectively tasks, time, and resources.

d7. Search for information and engage in life-long self learning discipline.

d8. Acquire entrepreneurial skills.

d9. Refer to relevant literatures.