

ACADEMIC STANDARDS

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# ACADEMIC STANDARDS

*Adopted By*

Faculty of Engineering- Mansoura University  
(B.SC. & POST)

*According To*

National Academic Reference Standards  
(NARS)

FOR ENGINEERING

2nd Edition

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ACADEMIC STANDARDS

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ACADEMIC STANDARDS

# PART I

National Academic Reference Standards (NARS) For Engineering

(B.Sc. Degree)

Faculty of Engineering

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Mansoura University

## 1- PREFACE

The National Academic Reference Standards (NARS) provide a means for the academic community to describe the nature and characteristics of academic programs in different specific area. They also represent the general expectations about standards for the award of qualifications at a given level in terms of the attributes and capabilities that those possessing such qualifications should have demonstrated.

The learning outcomes are expressed for threshold levels that engineering student are expected to achieve upon graduation. It is anticipated that many programs may exceed these levels. Program providers may therefore use NARS to establish standards for a diverse range of programs with innovation and creativity in curriculum design.

## 2- NATIONAL ACADEMIC REFERENCE STANDARDS (NARS) FOR ENGINEERING

Faculty of Engineering Mansoura University (FOE-MU) aims to have graduates which must be competent throughout their working life by virtue of their education, training and experience. Graduate of FOE-MU have the attributes that stated in the National Academic Reference Standards (NARS).

### 2-1 THE ATTRIBUTES OF THE ENGINEER

The FOE engineer must have the ability to:

- 1) Apply knowledge of mathematics, science and engineering concepts to the solution of engineering problems.
- 2) Design a system; component and process to meet the required needs within realistic constraints.
- 3) Design and conduct experiments as well as analyze and interpret data.
- 4) Identify, formulate and solve fundamental engineering problems.
- 5) Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.
- 6) Work effectively within multi-disciplinary teams.
- 7) Communicate effectively.
- 8) Consider the impacts of engineering solutions on society & environment.
- 9) Demonstrate knowledge of contemporary engineering issues.
- 10) Display professional and ethical responsibilities; and contextual understanding.
- 11) Engage in self- and life- long learning.

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### 2-2 FOE – MU ACADEMIC REFERENCE STANDARDS

The academic reference standards represent the general expectations about the qualifications, attributes and capabilities that graduates of the engineering programs should be able to demonstrate:

#### 1) KNOWLEDGE AND UNDERSTANDING:

The graduates of the engineering programs should be able to demonstrate the knowledge and understanding of:

- 1) Concepts and theories of mathematics and sciences, appropriate to the discipline.
- 2) Basics of information and communication technology (ICT)
- 3) Characteristics of engineering materials related to the discipline.
- 4) Principles of design including elements design, process and/or a system related to specific disciplines.
- 5) Methodologies of solving engineering problems, data collection and interpretation.
- 6) Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.
- 7) Business and management principles relevant to engineering.
- 8) Current engineering technologies as related to disciplines.
- 9) Topics related to humanitarian interests and moral issues.
- 10) Technical language and report writing
- 11) Professional ethics and impacts of engineering solutions on society and environment.
- 12) Contemporary engineering topics.

#### 2) INTELLECTUAL SKILLS

The graduates of the engineering programs should be able to:

- 1) Select appropriate mathematical and computer-based methods for modeling and analyzing problems.
- 2) Select appropriate solutions for engineering problems based on analytical thinking.
- 3) Think in a creative and innovative way in problem solving and design.
- 4) Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

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- 5) Assess and evaluate the characteristics and performance of components, systems and processes.
- 6) Investigate the failure of components, systems, and processes.
- 7) Solve engineering problems, often on the basis of limited and possibly contradicting information.
- 8) Select and appraise appropriate ICT tools to a variety of engineering problems.
- 9) Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.
- 10) Incorporate economic, societal, environmental dimensions and risk management in design.
- 11) Analyze results of numerical models and assess their limitations.
- 12) Create systematic and methodic approaches when dealing with new and advancing technology.

### 3) PRACTICAL AND PROFESSIONAL SKILLS

The graduates of the engineering programs should be able to:

- 1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve engineering problems.
- 2) Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.
- 3) Create and/or re-design a process, component or system, and carry out specialized engineering designs.
- 4) Practice the neatness and aesthetics in design and approach.
- 5) Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.
- 6) Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.
- 7) Apply numerical modeling methods to engineering problems.
- 8) Apply safe systems at work and observe the appropriate steps to manage risks.
- 9) Demonstrate basic organizational and project management skills.
- 10) Apply quality assurance procedures and follow codes and standards.

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- 11) Exchange knowledge and skills with engineering community and industry.
- 12) Prepare and present technical reports.

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### 4) GENERAL AND TRANSFERABLE SKILLS

The graduates of the engineering programs should be able to:

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

## 2-3 NARS CHARACTERIZATION FOR ENGINEERING DISCIPLINES

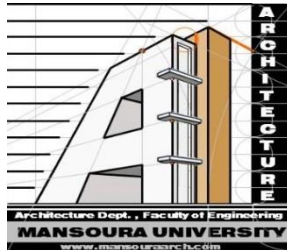
Indicative curricula content by subject area is given in the following table.

	<i>Subject Area</i>	<i>%</i>	<i>Tolerance</i>
A	Humanities and Social Sciences	11	9-12%
B	Mathematics and Basic Sciences Mathematics	21	20-26%
C	Basic Engineering Sciences		20-23%
D	Applied Engineering and Design		20-22%
E	Computing and ICT		9-11%
F	Project and practice	9	8-10%
	Subtotal	93	92-94%
G	Discretionary ( institution character identifying) Subjects	7	6-8%
	<b>Total</b>	<b>100</b>	<b>100%</b>

\*This part of the curriculum may be served in separate course(s) and/or included in several courses and its hours should be indicated in the course specification.



**3- ACADEMIC STANDARDS FOR THE PROGRAMS**



*3.1 Academic standards for*  
**ARCHITECTURE ENGINEERING**

**1-1 THE ATTRIBUTES OF AN ARCHITECTURAL ENGINEER**

In addition to the general attributes of engineer, the architect must be able to:

- 1) Design robust architectural projects with creativity and technical mastery.
- 2) Demonstrate investigative skills, attention to details, and visualize/ conceptualize skills.
- 3) Adopt a holistic problem solving approach for complex, ambiguous, and open-ended challenges and scenarios.
- 4) Demonstrate knowledge of cultural diversity, differences and the impact of a building on community character and identity.
- 5) Address urban issues, planning, and community needs through design work.
- 6) Recognize the new role of architectural engineer as the leader of design projects— who has the ability to understand, assemble, and coordinate all of the disciplines— to create a sustainable environment.

**1-2 ACADEMIC REFERENCE STANDARDS FOR ARCHITECTURE ENGINEERING PROGRAM**

The following academic reference standards represent the general expectation about the qualifications attributes and capabilities that the graduates of Architectural Engineering programs should be able to demonstrate.

**1) KNOWLEDGE AND UNDERSTANDING:**

In addition to the knowledge and understanding of engineers, the graduates of architectural engineering program should demonstrate knowledge and understanding of:

## ACADEMIC STANDARDS

- 1) Principles of architectural design, and the preparation and presentations of design projects in a variety of contexts, scales, types and degree of complexity.
- 2) Principles of building technologies, structure & construction methods, technical installations, properties of materials, and the way they may influence design decisions.
- 3) Fundamentals of building acquisition, operational costs, and of preparing construction documents and specifications of materials, components, and systems appropriate to the building.
- 4) Theories and legislations of urban and regional planning.
- 5) The processes of spatial change in the built and natural environments; patterns and problems of cities; and positive & negative impacts of urbanization.
- 6) The significance of urban spaces and the interaction between human behavior, built environment and natural environment.
- 7) Theories and histories of architecture, planning, urban design, and other related disciplines.
- 8) Physical modeling, multi-dimensional visualization, multimedia applications, and computer-aided design.
- 9) The role of the architecture profession relative to the construction industry and the overlapping interests of organizations representing the built environment.
- 10) Various dimensions of housing problem and the range of approaches, policies, and practices that could be carried out to solve this problem.
- 11) Principles of sustainable design, climatic considerations, and energy consumption and efficiency in buildings and their impacts on the environment.

### 2) INTELLECTUAL SKILLS

In addition to the intellectual skills of engineers, the graduates of architectural engineering program should be able to:

- 1) Integrate different forms of knowledge, ideas from other disciplines, and manage information retrieval to create new solutions.
- 2) Think three-dimensionally and engage images of places & times with innovation and creativity in the exploration of design.
- 3) Predict possible consequences, by- products and assess expected performance of design alternatives.

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- 4) Reconcile conflicting objectives and manage the broad constituency of interests to reach optimum solutions.
- 5) Integrate relationship of structure, building materials, and construction elements into design process.
- 6) Integrate community design parameters into design projects.
- 7) Appraise the spatial, aesthetic, technical and social qualities of a design within the scope and scale of a wider environment.
- 8) Discuss, search and formulate informed opinions appropriate to specific context and circumstances affecting architecture profession & practice.
- 9) Analyze the range of patterns and traditions that have shaped and sustained cultures and the way that they can inform design process.

### 3) PRACTICAL AND PROFESSIONAL SKILLS

In addition to the practical and professional skills of engineers, the graduates of architectural engineering program should be able to:

- 1) Produce and present architectural, urban design, and planning projects using an appropriate range of media and design-based software.
- 2) Produce professional workshop and technical drawings using traditional drawing and computer-aided drawings' techniques.
- 3) Use appropriate construction techniques and materials to specify and implement different designs.
- 4) Participate professionally in managing construction processes.
- 5) Demonstrate professional competence in developing innovative and appropriate solutions of architectural and urban problems.
- 6) Display imagination and creativity.
- 7) Respect all alternative solutions; changes in original plan of the project, differences in style, culture, experience and treat others with respect.
- 8) Provide leadership and education to the client particularly with reference to sustainable design principles.
- 9) Respond effectively to the broad constituency of interests with consideration of social and ethical concerns.
- 10) Contribute positively to the aesthetic, architecture and urban identity, and cultural life of the community.

### 4) GENERAL AND TRANSFERABLE SKILLS

The general and transferable skills of engineers are sufficient for the architect.

### *3.2 Academic Standards for*

#### **CIVIL ENGINEERING**

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##### **2-1 THE ATTRIBUTES OF AN CIVIL ENGINEER**

In addition to the general attributes of engineer, the civil engineer must be able to:

- 1) Act professionally in design and supervision of civil engineering disciplines
- 2) Use the codes of practice of all civil engineering disciplines effectively and professionally
- 3) Design, construct and protect all types of excavations and tunneling systems for different purposes.
- 4) Manage construction sites.
- 5) Select appropriate building materials from the perspective of strength, durability, suitability of use to location, temperature, weather conditions and impacts of seawater and environment.
- 6) Select and design adequate water control structures, irrigation and water networks, sewerage systems and pumping stations.
- 7) Define and preserve properties (lands, real estates) of individuals, communities and institutions, through different surveying and GIS tools.
- 8) Design and construct structures for protection against dangers of unexpected natural events such as floods and storms.
- 9) Lead and supervise a group of designers and site or lab technicians

##### **2-2 ACADEMIC REFERENCE STANDARDS FOR CIVIL ENGINEERING PROGRAM**

The following academic reference standards represent the general expectation about the qualifications attributes and capabilities that the graduates of Civil Engineering programs should be able to demonstrate.

## ACADEMIC STANDARDS

### 1) KNOWLEDGE AND UNDERSTANDING:

In addition to the knowledge and understanding of engineers, the graduates of civil engineering program should demonstrate knowledge and understanding of:

- 1) 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.
- 2) Properties, behavior and fabrication of building materials
- 3) Projects and construction management including planning, finance, bidding and contracts.

### 2) INTELLECTUAL SKILLS

In addition to the intellectual skills of engineers, the graduates of civil engineering program should be able to:

- 1) Select appropriate building materials from the perspective of strength, durability, suitability of use to location, temperature, weather conditions and impacts of seawater and environment.
- 2) Select and design adequate water control structures, irrigation and water networks, sewerage systems and pumping stations.
- 3) Analyze and select codes of practices in designing reinforced engineering concrete and metallic structures of all types. Determine the levels, types and design systems of building foundations, tunnels and excavations.
- 4) Define, plan, conduct and report management techniques.
- 5) Assess and evaluate different techniques and strategies for solving engineering problems.

### 3) PRACTICAL AND PROFESSIONAL SKILLS

In addition to the practical and professional skills of engineers, the graduates of civil engineering program should be able to:

- 1) Use laboratory and field equipment competently and safely.
- 2) Observe, record and analyze data in laboratory and in the field.
- 3) Practice professionally construction management skills. Prepare technical drafts and detailed drawings both manually and using CAD.
- 4) Carry out maintenance of all types of roadways and traffic systems.
- 5) Prepare quantity surveying reports
- 6) Plan, design, construct, operate, control and carry out maintenance of all types of roadways and traffic systems.

## ACADEMIC STANDARDS

### 4) GENERAL AND TRANSFERABLE SKILLS

The graduates of the engineering programs should be able to:

The general and transferable skills of engineers are sufficient for the civil engineer.



### 3.3 *Academic Standards for* **ELECTRONICS AND COMMUNICATION ENGINEERING**

#### **3-1 THE ATTRIBUTES OF ELECTRONICS AND COMMUNICATION ENGINEER**

In addition to the general attributes of engineer, the Electronics and Communication engineer must be able to:

- 1) Participate in and lead quality improvement projects.
- 2) Manipulate with the electronic circuits, all the way from the discrete components level, circuits' analysis and design, to the troubleshooting with emphasis on electronic power devices.
- 3) Apply control theory and measurement principals for industrial variables, signal conversion, conditioning and processing.
- 4) Deal with the computer hardware, software, operating systems and interfacing.
- 5) Design, operate and maintain digital and analog communication, mobile communication, coding, and decoding systems.

#### **3-2 ACADEMIC REFERENCE STANDARDS FOR ELECTRONICS AND COMMUNICATION ENGINEERING PROGRAM**

The following academic reference standards represent the general expectation about the qualifications attributes and capabilities that the graduates of Electronics and Communication Engineering programs should be able to demonstrate.

##### **1) KNOWLEDGE AND UNDERSTANDING:**

In addition to the Knowledge and Understanding of engineers, the graduates of Electronics and Communication engineering program should demonstrate knowledge and understanding of:

- 1) Elementary science underlying electronic engineering systems and information technology.
- 2) Basics of design and analyzing electronic engineering systems, while considering the constraints of applying inappropriate technology and the needs of commercial risk evaluation.

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- 3) Principles of Analyzing and design of electronic circuits and components.
- 4) Principles of Analyzing and design of control systems with performance evaluation.
- 5) Biomedical instrumentation.
- 6) Communication systems.
- 7) Coding and decoding techniques.
- 8) Microwave applications.
- 9) Antenna and wave propagation.
- 10) Nanotechnology application.
- 11) Usage of optical fiber.
- 12) Methods of fabrication of Integrated circuits.
- 13) Analysis of signal processing.
- 14) Optical communication systems.

### 2) INTELLECTUAL SKILLS

In addition to the intellectual skills of engineers, the graduates of Electronics and Communication engineering program should be able to:

- 1) Develop innovative solutions for the practical industrial problems.
- 2) Plan, conduct and write a report on a project or assignment.
- 3) Analyze the performance of digital and analog communication, mobile communication, coding, and decoding systems.
- 4) Synthesis and integrate electronic systems for certain specific function using the right equipment.

### 3) PRACTICAL AND PROFESSIONAL SKILLS

In addition to the Practical and Professional skills of engineers, the graduates of Electronics and Communication engineering program should be able to:

- 1) Use appropriate mathematical methods or IT tools.
- 2) Practice computer programming for the design and diagnostics of digital and analog communication, mobile communication, coding, and decoding systems.
- 3) Use relevant laboratory equipment and analyze the results correctly.
- 4) Troubleshoot, maintain and repair almost all types of electronic systems using the standard tools.
- 5) Identify appropriate specifications for required devices.
- 6) Use appropriate tools to measure system performance.



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### **4) GENERAL AND TRANSFERABLE SKILLS**

The general and transferable skills of engineers are sufficient for the Electronics and Communication engineer.



### 3.4 *Academic Standards for* **COMPUTERS AND SYSTEMS ENGINEERING**

#### **4-1 THE ATTRIBUTES OF A COMPUTERS AND SYSTEMS ENGINEER**

In addition to the general attributes of engineer, the Computers and Systems engineer must be able to:

- 1) Demonstrate inductive reasoning abilities, figuring general rules and conclusions about seemingly unrelated events.
- 2) Use current advanced techniques, skills, and tools necessary for computing practices to specify, design, and implement computer-based systems.
- 3) Recognize the information requirements of various business activities on both operational and decision making levels.
- 4) Tackling business problems using system analysis tools and techniques.
- 5) Managing projects related to computer systems in diverse fields of applications.
- 6) Implementing phases of the computer system development life cycle, procurement and installation of hardware, software design, data manipulation and system operations.

#### **4-2 ACADEMIC REFERENCE STANDARDS FOR COMPUTERS AND SYSTEM ENGINEERING PROGRAM**

The following academic reference standards represent the general expectation about the qualifications attributes and capabilities that the graduates of Computers and systems engineering program should be able to demonstrate.

##### **1) KNOWLEDGE AND UNDERSTANDING:**

In addition to the Knowledge and Understanding of engineers, the graduates of computers and systems engineering program should demonstrate knowledge and understanding of:

- 1) Engineering principles in the fields of logic design, circuit analysis, machine and assembly languages, computer organization and architectures, memory hierarchy, advanced computer architectures, embedded systems,

## ACADEMIC STANDARDS

- signal processing, operating systems, real-time systems and reliability analysis.
- 2) Quality assessment of computer systems.
- 3) Related research and current advances in the field of computer software and hardware.
- 4) Technologies of data, image and graphics representation and organization on computer storage media.
- 5) Modern trends in information technology and its fundamental role in business enterprises.

### 2) INTELLECTUAL SKILLS

In addition to the Intellectual Skills of engineers, the graduates of computers and systems engineering program should be able to:

- 1) Select the appropriate mathematical tools, computing methods, design techniques for modeling and analyzing computer systems.
- 2) Select, synthesize, and apply suitable IT tools to computer engineering problems.
- 3) Proposing 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.
- 4) Identifying symptoms in problematic situations.
- 5) Innovating solutions based on non-traditional thinking and the use of latest technologies.
- 6) Capability of integrating computer objects running on different system configurations.

### 3) PRACTICAL AND PROFESSIONAL SKILLS

In addition to the Practical and Professional skills of engineers, the graduates of computers and systems engineering program should be able to:

- 1) Design and operate computer-based systems specifically designed for business applications.
- 2) Use appropriate specialized computer software, computational tools and design packages throughout the phases of the life cycle of system development.
- 3) Write computer programs on professional levels achieving acceptable quality measures in software development.
- 4) Conducting user support activities competently.

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### **4) GENERAL AND TRANSFERABLE SKILLS**

The general and transferable skills of engineers are sufficient for the computers and systems engineer.



### 3.5 Academic Standards for ELECTRICAL POWER AND MACHINES ENGINEERING

#### 5-1 THE ATTRIBUTES OF ELECTRICAL POWER AND MACHINES ENGINEERS

In addition to the general attributes of engineer, the Electrical Power and Machines engineer should be able to:

- 1) Design and supervise the construction of systems to generate, transmit, control and use electrical energy.
- 2) Design and develop heavy equipment, such as generators, motors, transmission lines and distributing systems.
- 3) Plan and manage engineering activity during the diverse phases of electric power generation, transmission and control.
- 4) Prepare and reviews simple sketches, specifications and data sheets for electric power generation, control and distribution systems.
- 5) Perform design reviews and checks for electric power generation and distribution systems.
- 6) Perform review of supplier documentation for compliance with specifications.
- 7) Develops load lists.
- 8) Develops low voltage power systems.

#### 5-2 ACADEMIC REFERENCE STANDARDS FOR ELECTRICAL POWER AND MACHINES ENGINEERING PROGRAM

The following academic reference standards represent the general expectation about the qualifications attributes and capabilities that the graduates of Electrical Power and Machines Engineering programs should be able to demonstrate.

##### 1) KNOWLEDGE AND UNDERSTANDING:

In addition to the Knowledge and Understanding of engineers, the graduates of electrical Power and Machines engineering program should demonstrate knowledge and understanding of:

## ACADEMIC STANDARDS

- 1) Analytical and computer methods appropriate for electrical power and machines engineering.
- 2) Design methods and tools for electrical power and machines equipment and systems.
- 3) Principles of operation and performance specifications of electrical and electromechanical engineering systems.
- 4) Fundamentals of engineering management.
- 5) Basic electrical power system theory.
- 6) Theories and techniques for calculating short circuit, motor starting, and voltage drop.
- 7) Diverse applications of electrical equipment.
- 8) Logic circuits.
- 9) Basic power system design concepts for underground, cable tray, grounding, and lighting systems.
- 10) Basics of low voltage power systems.
- 11) Principles of performing electrical system calculations, including load flow, earthing and equipment sizing.

### 2) INTELLECTUAL SKILLS

In addition to the Intellectual Skills of engineers, the graduates of electrical Power and Machines engineering program should be able to: engineering graduates should be able to:

- 1) Identify and formulate engineering problems to solve problems in the field of electrical power and machines engineering.
- 2) Analyze design problems and interpret numerical data and test and examine components, equipment and systems of electrical power and machines.
- 3) Integrate electrical, electronic and mechanical components and equipment with transducers, actuators and controllers in creatively computer controlled systems.
- 4) Analyze the performance of electric power generation, control and distribution systems.

### 3) PRACTICAL AND PROFESSIONAL SKILLS

In addition to the Practical and Professional skills of engineers, the graduates of electrical power and machines engineering program should be able to:

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

## ACADEMIC STANDARDS

- 2) Test and examine components, equipment and systems of electrical power and machines.
- 3) Integrate electrical, electronic and mechanical components and equipment with transducers, actuators and controllers in creatively computer controlled systems.
- 4) Specify and evaluate manufacturing of components and equipment related to electrical power and machines.
- 5) Apply modern techniques, skills and engineering tools to electrical power and machines engineering systems.

### 4) GENERAL AND TRANSFERABLE SKILLS

The general and transferable skills of engineers are sufficient for the Electrical Power and Machines engineer.

### 3.6 *Academic Standards for*

## MECHANICAL POWER ENGINEERING

### 6-1 THE ATTRIBUTES OF A MECHANICAL POWER ENGINEER

In addition to the general attributes of engineer, the Mechanical Power engineer should be able to:

- 1) Evaluate the sustainability and environmental issues related to mechanical power systems.
- 2) Use energy efficiently.
- 3) Apply industrial safety.
- 4) Apply and integrate knowledge, understanding and skills of different subjects and available computer software to solve real problems in industries and power stations.
- 5) Lead or supervise a group of engineers, technicians and work force.
- 6) Carry out preliminary designs of fluid transmission and power systems, investigate their performance and solve their essential operational problems.
- 7) Design, operate and maintain internal combustion and steam engines.

### 6-2 ACADEMIC REFERENCE STANDARDS FOR MECHANICAL POWER PROGRAM

The following academic reference standards represent the general expectation about the qualifications attributes and capabilities that the graduates of Mechanical Power Engineering programs should be able to demonstrate.

#### 1) KNOWLEDGE AND UNDERSTANDING:

In addition to the Knowledge and Understanding of engineers, the graduates of mechanical power engineering program should demonstrate knowledge and understanding of:

- 1) Fundamentals of thermal and fluid processes.
- 2) Internal combustion, pumps, turbines and compressors, classification, construction design concepts, operation and characteristics.



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- 3) Fluid power systems.
- 4) The constraints which mechanical power and energy engineers have to judge to reach at an optimum solution.
- 5) Business and management techniques and practices appropriate to mechanical power and energy engineering applications.
- 6) Mechanical power and energy engineering contemporary issues.
- 7) Basic theories and principles of some other engineering and mechanical engineering disciplines providing support to mechanical power and energy disciplines.

### 2) INTELLECTUAL SKILLS

In addition to the Intellectual Skills of engineers, the graduates of mechanical power engineering program should be able to:

- 1) Evaluate mechanical power and energy engineering designs, processes and performances and propose improvements.
- 2) Analyze and interpret data, and design experiments to obtain new data.
- 3) Evaluate the power losses in the fluid transmission lines and networks.
- 4) Analyze the performance of the basic types of internal combustion engines and hydraulic machines.
- 5) Analysis of fluid power systems, subsystems and various control valves and actuators.

### 3) PRACTICAL AND PROFESSIONAL SKILLS

In addition to the Practical and Professional Skills of engineers, the graduates of mechanical power engineering program should be able to:

- 1) Use basic workshop equipment safely and appropriately.
- 2) Prepare engineering drawings, computer graphics and specialized technical reports.
- 3) Write computer programs pertaining to mechanical power and energy engineering.
- 4) Describe the basic Thermal and fluid processes mathematically and use the computer software for their simulation and analysis.
- 5) Design, operate, repair and maintain fluid hydraulic power systems for diverse applications.
- 6) Carry out preliminary designs of fluid transmission networks, internal combustion and steam engines and solve their operational problems.
- 7) Work in mechanical power and energy operations, maintenance and overhaul.

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### **4) GENERAL AND TRANSFERABLE SKILLS**

The general and transferable skills of engineers are sufficient for the mechanical power\_engineer.



### 3.7 Academic Standards for

#### PRODUCTION AND MECHANICAL DESIGN ENGINEERING

##### 7-1 THE ATTRIBUTES OF A PRODUCTION & MECHANICAL DESIGN ENGINEER

In addition to the general attributes of engineer, the Production and Mechanical Design engineer should be able to:

- 1) Work with mechanical design and manufacturing systems.
- 2) Use of mathematics and physical and engineering sciences and systems analysis tools in components and machines and produce design and manufacture.
- 3) Use different instruments appropriately and carry-out experimental design, automatic data acquisition, data analysis, data reduction and interpretation, and data presentation, both orally and in the written form.
- 4) Use the computer graphics for design, communication and visualization.
- 5) Use and/or develop computer software, necessary for the design, manufacturing and management of industrial systems and projects.
- 6) Analyze multi-disciplinary mechanical, electrical, thermal and hydraulic systems.
- 7) Lead or supervise a group of designers or technicians and other work force.

##### 7-2 ACADEMIC REFERENCE STANDARDS FOR PRODUCTION & MECHANICAL DESIGN PROGRAM

The following academic reference standards represent the general expectation about the qualifications attributes and capabilities that the graduates of Production and Mechanical Design Engineering programs should be able to demonstrate.

###### 1) KNOWLEDGE AND UNDERSTANDING:

In addition to the Knowledge and Understanding of engineers, the graduates of Production and Mechanical Design engineering program should demonstrate knowledge and understanding of:

## ACADEMIC STANDARDS

- 1) Concepts, principles and theories relevant to Mechanical Engineering and manufacture.
- 2) The constraints within which his/her engineering judgment will have to be exercised.
- 3) The specifications, programming and range of application of CAD and CAD/CAM facilities.
- 4) Relevant contemporary issues in mechanical engineering.
- 5) Basic electrical, control and computer engineering subjects related to the discipline.
- 6) The role of information technology in providing support for mechanical engineers.
- 7) Engineering design principles and techniques.
- 8) Management and business techniques and practices appropriate to engineering industry.

### 2) INTELLECTUAL SKILLS

In addition to the Intellectual Skills of engineers, the graduates of Production and Mechanical Design program should be able to:

- 1) Apply the principles of mathematics, science and technology in problem solving scenarios in mechanical engineering.
- 2) Analyze and interpret data, and design experiments to obtain primary data.
- 3) Evaluate and appraise designs, processes and products, and propose improvements.
- 4) Interpret numerical data and apply analytical methods for engineering design purposes.
- 5) Use the principles of engineering science in developing solutions to practical mechanical engineering problems.
- 6) Select appropriate manufacturing method considering design requirements.

### 3) PRACTICAL AND PROFESSIONAL SKILLS

In addition to the Practical and Professional Skills of engineers, the graduates of Production and Mechanical Design program should be able to:

- 1) Prepare engineering drawings, computer graphics and specialized technical reports and communicate accordingly.
- 2) Employ the traditional and modern CAD and CAD/CAM facilities in design and production processes.
- 3) Use basic workshop equipment safely.

## ACADEMIC STANDARDS

- 4) Analyze experimental results and determine their accuracy and validity.
- 5) Use laboratory equipment and related computer software.
- 6) Operate and maintain mechanical equipment.
- 7) Prepare the process plan for manufacturing.

### 4) GENERAL AND TRANSFERABLE SKILLS

The general and transferable skills of engineers are sufficient for Production and Mechanical Design Engineer.



### 3.8 *Academic Standards for* TEXTILE AND SPINNING ENGINEERING

#### **8-1 THE ATTRIBUTES OF A TEXTILE AND SPINNING ENGINEER**

In addition to the general attributes of engineer, the Textile and Spinning engineer should be able to:

- 1) Professionally design and operate different processing systems in the textile industries and plan the related activities of maintenance, modernization and replacement.
- 2) Improve production plans and effectively apply the special safety measures to preserve inventories of raw materials and semi-manufactured products as well.
- 3) Plan and manage the quality assurance activities in addition to insuring the protection of the production facility environment internally and externally.

#### **8-2 ACADEMIC REFERENCE STANDARDS FOR TEXTILE AND SPINNING PROGRAM**

The following academic reference standards represent the general expectation about the qualifications attributes and capabilities that the graduates of Mechanical Power Engineering programs should be able to demonstrate.

##### **1) KNOWLEDGE AND UNDERSTANDING**

In addition to the Knowledge & Understanding of engineer, the graduates of Textile and Spinning engineering program should demonstrate knowledge and understanding of:

- 1) Properties of the textile materials
- 2) Technologies of textile productions.
- 3) Systems of quality assurance for processing operations and final products.
- 4) Management systems and their application in textile industry.
- 5) Knowledge necessary to analyze the impact of textile engineering in global and social context.

**2) INTELLECTUAL SKILLS:**

In addition to the Intellectual Skills of engineer, the graduates of textile and Spinning engineering program should be able to:

- 1) Creative thinking in textile production system design and operation.
- 2) Selecting and applying the special tools and software packages used in textile engineering for modeling and analyzing design and production problems.
- 3) Identifying optimization criteria and assessing the delicate balance of cost, quality and effects on the environment in production operations.
- 4) Analyzing textile products and manufacturing processes and proposing improvement ideas.

**3) PRACTICAL & PROFESSIONAL SKILLS**

In addition to the Practical & Professional Skills of engineer, the graduates of textile and Spinning engineering program should be able to:

- 1) Operate and maintain safely & correctly the production machines specially used in textile industry.
- 2) Design new textile products and perform the required production experiments and tests.
- 3) Perform experiments in the special textile laboratories, record & analyze data, and write technical reports.
- 4) Plan and design production processes necessary for different textile products.

**4- GENERAL AND TRANSFERABLE SKILLS**

The general and transferable skills of engineers are sufficient for the Textile and Spinning engineer.



### 3.9 *Academic Standards for*

## COMMUNICATIONS AND INFORMATION ENGINEERING

### 9-1 THE ATTRIBUTES OF A COMMUNICATIONS AND INFORMATION ENGINEER

In addition to the general attributes of engineer, the Communications and Information Engineering program aims to provide future engineers with appropriate theoretical knowledge and technical skills to respond to professional market demand. The following are the aimed graduate attributes:

- 1) Manipulate with the electronic circuits, all the way from the discrete components level, circuits' analysis and design, to the troubleshooting with emphasis on electronic power devices.
- 2) Design, operate and maintain digital and analog communication, mobile communication, coding, and decoding systems.
- 3) Demonstrate inductive reasoning abilities, figuring general rules and conclusions about seemingly unrelated events
- 4) Use current advanced techniques, skills, and tools necessary for computing practices to specify, design, and implement computer-based systems.
- 5) Recognize the information requirements of various business activities on both operational and decision making levels.
- 6) Tackling business problems using system analysis tools and techniques.
- 7) Managing projects related to computer systems in diverse fields of applications.
- 8) Implementing phases of the computer system development life cycle, procurement and installation of hardware, software design, data manipulation and system operations.

### 9-2 ACADEMIC REFERENCE STANDARDS FOR TEXTILE AND SPINNING PROGRAM

The following academic reference standards represent the general expectation about the qualifications attributes and capabilities that the graduates of Communications and Information Engineering programs should be able to demonstrate.



## ACADEMIC STANDARDS

### 1) KNOWLEDGE AND UNDERSTANDING

In addition to the Knowledge & Understanding of engineer, the graduates of Communications and Information engineering program should demonstrate knowledge and understanding of:

- 1) Principles of Analyzing and design of electronic circuits and components; Principles of Analyzing and design of control systems with performance evaluation.
- 2) Biomedical instrumentation;
- 3) Communication systems.
- 4) Coding and decoding techniques.
- 5) Microwave applications.
- 6) Antenna and wave propagation.
- 7) Nanotechnology application.
- 8) Usage of optical fiber.
- 9) Engineering principles in the fields of logic design, circuit analysis, machine and assembly languages, computer organization and architectures, memory hierarchy, advanced computer architectures, embedded systems, signal processing, operating systems, real-time systems and reliability analysis.
- 10) Related research and current advances in the field of computer software and hardware.

### 2) INTELLECTUAL SKILLS:

In addition to the Intellectual Skills of engineer, the graduates of the Communications and Information Engineering program should be able to:

- 1) Select the appropriate mathematical tools, computing methods, design techniques for modeling and analyzing computer systems.
- 2) Select, synthesize, and apply suitable IT tools to computer engineering problems.
- 3) Proposing 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.
- 4) Identifying symptoms in problematic situations.
- 5) Innovating solutions based on non-traditional thinking and the use of latest technologies
- 6) Capability of integrating computer objects running on different system configurations.

### 3) PRACTICAL & PROFESSIONAL SKILLS

In addition to the Practical & Professional Skills of engineer, the graduates of Communications and Information engineering program should be able to:

- 1) Design and operate computer-based systems specifically designed for business applications.
- 2) Use appropriate specialized computer software, computational tools and design packages throughout the phases of the life cycle of system development;
- 3) Write computer programs on professional levels achieving acceptable quality measures in software development.
- 4) Conducting user support activities competently.

### 4) GENERAL AND TRANSFERABLE SKILLS

The general and transferable skills of engineers are sufficient for the Communications and Information engineer.



### 3.10 *Academic Standards for*

#### **BUILDING AND CONSTRUCTION ENGINEERING (BCE)**

##### **10-1 THE ATTRIBUTES OF A BUILDING AND CONSTRUCTION ENGINEER**

In addition to the general attributes of engineer, the (civil) construction engineer must be able to:

- 1) Act professionally in design and supervision of civil engineering disciplines.
- 2) Use the codes of practice of all civil engineering disciplines effectively and professionally.
- 3) Manage construction sites.
- 4) Select appropriate building materials from the perspective of strength, durability, suitability of use to location, temperature, weather conditions and impacts of seawater and environment.
- 5) The concepts, methods and techniques of the building construction processes, its stages, elements, material, etc.
- 6) Design and conduct experiments and analyze and interpret data.
- 7) Design, construct and protect all types of concrete and steel structures, irrigation structures, excavations, tunneling systems, water control structures, water networks and sewerage systems, and pumping stations for different purposes.
- 8) Manage engineering projects subjected to economic, environmental and social constraints.
- 9) Lead and supervise a group of designers and site or lab technicians.
- 10) Work efficiently within multi-disciplinary teams.

##### **10-2 ACADEMIC REFERENCE STANDARDS FOR BUILDING AND CONSTRUCTION PROGRAM**

The following academic reference standards represent the general expectation about the qualifications attributes and capabilities that the graduates of Building and Construction programs should be able to demonstrate.

##### **1) KNOWLEDGE AND UNDERSTANDING**

## ACADEMIC STANDARDS

In addition to the Knowledge & Understanding of engineer, the graduates of Building and Construction engineering program should demonstrate knowledge and understanding of:

- 1) Essential facts, concepts, principles and theories of mathematics, science, and engineering subjects relevant to construction engineering.
- 2) The concepts, methods and techniques of the building construction processes, its stages, elements, material, etc.
- 3) Engineering principles in the fields of reinforced concrete and metallic structures analysis and design, geotechnics and foundations, hydraulics and hydrology, water resources, environmental and sanitary engineering, roadways and traffic systems, surveying and photogrammetry.
- 4) Properties and behavior of building materials and up-to-date technology relevant to civil engineering disciplines.
- 5) Projects and construction management, including planning, finance, bidding and contracts.
- 6) Codes of practice in civil engineering disciplines and the regularity framework in design and practice.
- 7) Professional and ethical responsibilities that should be taken by civil engineer.
- 8) Broad education necessary to understand the impact of civil engineering solutions on the environment.
- 9) Seeking, defining and articulating architectural and urban planning problems.
- 10) Preliminary and final design, working drawings and details of architectural and urban planning.

### 2) INTELLECTUAL SKILLS:

In addition to the Intellectual Skills of engineer, The graduates of the Building and Construction Engineering program should be able to:

- 1) Adopt appropriate mathematical principles, natural sciences, technology, computing methods, design techniques and codes of practice in civil engineering disciplines, for modeling, analyzing and solving engineering problems.
- 2) Adopt, create and innovate thinking in solving problems, and in designing systems, components and processes.
- 3) Apply appropriate structural analysis and codes of practice in designing reinforced concrete and metallic structures of all types.

## ACADEMIC STANDARDS

- 4) Apply appropriate geotechnical techniques and codes of practice to determine levels, types and design systems of building foundations, tunnels and excavations.
- 5) Define, plan, conduct and report management techniques.
- 6) Use of appropriate knowledge in planning and designing highways and transportation systems.
- 7) Apply engineering principles, theories and sciences in solving environmental problems.
- 8) Assess and analyze risks, and take appropriate steps to manage them.
- 9) Use basic knowledge of hydraulics in planning and designing water canals, harbors and water irrigation structures.
- 10) Solve technical and structural problems of buildings and analyze their elements, details, materials and methods of execution.

### 3) PRACTICAL & PROFESSIONAL SKILLS

In addition to the Practical & Professional Skills of engineer, the graduates of Building and Construction engineering program should be able to:

- 1) Ability to prepare technical drafts and finished drawings both manually and using CAD.
- 2) Use laboratory and field equipment competently and safely.
- 3) Observe record and analyze data in laboratory as well as in the field.
- 4) Demonstrate basic organizational and construction management skills.
- 5) Use appropriate specialized computer software, computational tools and packages.
- 6) Prepare quantity surveying reports.
- 7) Give technical presentations.
- 8) Refer effectively to relevant literature.
- 9) Implement comprehensive engineering knowledge and understanding in engineering applications.
- 10) Recognize different construction and finishing materials and select appropriate material for each specific purpose.
- 11) Prepare engineering designs in different civil engineering disciplines.

### 4) GENERAL AND TRANSFERABLE SKILLS

The general and transferable skills of engineers are sufficient for the Building and Construction engineer.

# PART 2

National Academic Reference Standards (NARS) For Engineering

(Post Graduate Studies)

## 1. POSTGRADUATE DIPLOMA PROGRAMS

### 1. Attributes Of The Graduate

The graduate of the postgraduate diploma programs must be able to:

- 1) Apply knowledge of specialized engineering concepts that gained through the professional practice.
- 2) Identify and solve engineering problems.
- 3) Master some professional skills and use of appropriate technological means to serve the professional practice.
- 4) Communicate and lead team works effectively through professional system.
- 5) Make decisions in light of available information.
- 6) Employ available resources efficiently.
- 7) Consider the detrimental impact of the engineer role on society and environment
- 8) Display professional responsibilities and ethical, societal and cultural concerns
- 9) Recognize the need to develop itself and engage in continuous learning

### 2. General Standards

#### **2.1 KNOWLEDGE AND UNDERSTANDING**

With the completion of the postgraduate diploma program, the graduate will be able to understand:

- 1) Theories, concepts and specialized knowledge of the learning area and also sciences appropriate to the professional practice.
- 2) Moral and legal ethics of the professional practice in the area of specialization.
- 3) Concepts and principles of quality of the professional practice in the area of specialization.
- 4) The impact of the professional practice in the environment and its preservation.

#### **2.2 INTELLECTUAL SKILLS**

With the completion of the postgraduate diploma program, the graduate will be able to:

- 1) Specify and analyze problems in the area of specialization with arrangement according to their priority.

## ACADEMIC STANDARDS

- 2) Solve specific problems in the area of specialization.
- 3) Demonstrate a high level of competence in the analysis of researches and subjects related to the specialization.
- 4) Risk assessment in the professional practices.
- 5) Take technical decisions based upon available information.

### 2.3 PROFESSIONAL SKILLS

With the completion of the post graduate diploma program, the graduate will be able to:

- 1) Apply professional skills in the area of specialization.
- 2) Write technical reports.

### 2.4 GENERAL AND TRANSFERABLE SKILLS

With the completion of the post graduate diploma program, the graduate will be able to:

- 1) Communicate effectively in different aspects.
- 2) Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.
- 3) Adopt self-assessment and specify his personal learning needs.
- 4) Use different resources for information and knowledge.
- 5) Collaborate effectively within multidisciplinary team with good time management.
- 6) Lead a team in familiar professional contexts.
- 7) Continuous self-learning.



## 2. MASTER PROGRAMS

### 1. Attributes Of The Graduate

The graduate of the master program must be able to:

- 1) Master the basics and methodologies of scientific research with versatile use of its variable tools.
- 5) Apply the analytical approach and its use in the field of specialization.
- 6) Apply the specialized knowledge integrated with specialized engineering concepts related to the professional practice.
- 7) Show awareness of the ongoing problems and modern visions in the area of specialization.
- 8) Identify and solve engineering problems.
- 9) Master some professional skills and use of appropriate technological means to serve the professional practice.
- 10) Communicate and lead team works effectively.
- 11) Take good decisions in different professional aspects.
- 12) Employ available resources efficiently.
- 13) Adopt awareness of the detrimental impact of the engineer role on society and environment under the global and regional variables.
- 14) Display professional responsibilities and ethical, societal and cultural concerns.
- 15) Recognize the need to engage to develop itself and engage in continuous learning.

### 2. General Standards

#### **2.1 KNOWLEDGE AND UNDERSTANDING**

With the completion of the master program, the graduate will have knowledge and understanding in:

- 1) Theories, concepts and specialized knowledge of the learning area and also sciences appropriate to the professional practice.
- 2) Mutual influence between professional practice and its impacts on the environment.
- 3) Scientific developments in the field of specialization
- 4) Moral and legal ethics of the professional practice in the area of specialization.
- 5) The concepts and principles of quality of the professional practice in the area of specialization.

## ACADEMIC STANDARDS

- 6) The basics and ethics of scientific research.

### 2.2 INTELLECTUAL SKILLS

With the completion of the master program, the graduate will be able to:

- 1) Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.
- 2) Solve specific problems on the basis of limited and contradictory information.
- 3) Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.
- 4) Carry out a research study and / or writing a scientific methodology study on research problem.
- 5) Assess and analyze risks of the professional practice in the field of specialization.
- 6) Plan to improve performance in the field of specialization
- 7) Make career decisions in different professional aspects.

### 2.3 PROFESSIONAL SKILLS

With the completion of the master program, the graduate will be able to:

- 1) Apply modern and principle professional skills in the area of specialization.
- 2) Write and evaluate technical reports.
- 3) Adopt assessment methods and tools existing in the area of specialization.

### 2.4 GENERAL AND TRANSFERABLE SKILLS

With the completion of the post graduate diploma program, the graduate will be able to:

- 1) Communicate effectively in different aspects.
- 2) Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.
- 3) Adopt self-assessment and specify his needs of personal learning.
- 4) Use different resources for information and knowledge.
- 5) Establish rules and indicators for assessing the performance of others.
- 6) Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.
- 7) Demonstrate a high level of competence in the time management.
- 8) Continuous self-education.

### 3. PHD PROGRAMS

#### 1. The Attributes Of The Graduate

The graduate of the PhD program of any specialization must be able to:

- 1) Master the basics and methodologies of scientific research.
- 2) Work continuously to add more knowledge in the field of specialization.
- 3) Apply the analytical approach with critical survey in the field of specialization and other related fields.
- 4) Integrate the specialized knowledge with relevant knowledge with ability to deduce and develop the mutual relationships.
- 5) Show deep awareness of the ongoing problems and modern theories in the area of specialization.
- 6) Identify, formulate and solve engineering problems with innovative solutions.
- 7) Master a wide range of the professional skills in the field of specialization.
- 8) Develop new methods, tools and techniques professional practice
- 9) Use of the appropriate technological means to serve the professional practice.
- 10) Communicate and lead team works effectively in different professional aspects.
- 11) Make technical decisions based upon available information.
- 12) Employ of the available resources with high motivation to develop and create new resources.
- 13) Consider the detrimental impact of the engineer role on society and environment
- 14) Display professional responsibilities and ethical, societal and cultural concerns.
- 15) Commit itself to continuing self-development and transfer of knowledge and expertise to others.

## 2. General Standards

### **2.1 KNOWLEDGE AND UNDERSTANDING**

With the completion of the master program, the graduate will have knowledge and understanding in:

- 1) The theories, concepts and modern knowledge in the field of specialization and other related fields.
- 2) The basics, methodologies, ethics of scientific research and its versatile tools.
- 3) The moral and legal ethics of the professional practice in the area of specialization.
- 4) The concepts and principles of quality of the professional practice in the area of specialization.
- 5) The knowledge on the effects of professional practice on the environment and ways of development and maintenance of the environment.

### **2.2 INTELLECTUAL SKILLS**

With the completion of the master program, the graduate will be able to:

- 1) Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.
- 2) Solve specific problems on the basis of limited and contradictory information.
- 3) Carry out a research studies to add new information to the knowledge.
- 4) Write scientific papers.
- 5) Assess and analyze risks in the field of specialization.
- 6) Plan to improve performance in the field of specialization.
- 7) Make good decisions in different professional aspects.
- 8) Have innovation/creativity.
- 9) Discuss and negotiate in high level of confidence based upon proofs and evidences

### **2.3 PROFESSIONAL SKILLS**

With the completion of the master program, the graduate will be able to:

- 1) Apply modern and principle professional skills in the area of specialization.
- 2) Write and evaluate technical reports.
- 3) Adopt assessment methods and tools existing in the area of specialization.

## ACADEMIC STANDARDS

- 4) Use of the appropriate technological means to serve the professional practice.
- 5) Plan to improve the performance of the professional practice and development of the performance of others.

### 2.4 GENERAL AND TRANSFERABLE SKILLS

With the completion of the post graduate diploma program, the graduate will be able to:

- 1) Communicate effectively in different aspects.
- 2) Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.
- 3) Manage the scientific meetings and manage time.
- 4) Adopt self-assessment and Adopt life-long learning.
- 5) Use different resources for information and knowledge.
- 6) Collaborate effectively within multidisciplinary team and lead team works.
- 7) Demonstrate a high level of competence in the management of time and scientific meetings.

### 1- KNOWLEDGE AND UNDERSTANDING

The acquired knowledge and understanding of key facts, theories, concepts, principles and techniques relevant to specialized disciplines.

### 2- INTELLECTUAL SKILLS

Skills that demonstrate the ability to:

- Present, evaluate, and interpret qualitative and quantitative data, to develop lines of argument and make sound judgments in accordance with basic theories, concepts and know-how within the discipline.
- Solve problems, even with limited or contradictory data, taking into concern different constraints, such as economy, safety, quality, environmental impacts and ethics.

### 3- PRACTICAL AND PROFESSIONAL SKILLS

Skills that demonstrate the ability to:

- Apply and adopt the knowledge and intellectual skills into professional applications.
- Use tools, techniques, equipment and software relevant to the discipline.
- Develop, promote and apply reliable systems of work related to the profession.

### 4- GENERAL AND TRANSFERABLE SKILLS

Those general skills which are central to occupational competence in all sectors and at all levels, such as:

- Personal skills.
- Communication.
- Information technology.
- Working with others.
- Improving own learning and performance.

### 5- SUBJECT AREAS

#### A- HUMANITIES AND SOCIAL SCIENCES

## ACADEMIC STANDARDS

- Acquiring knowledge of non-engineering fields that strengthen the consciousness of the engineer of the society and its culture, including business, marketing, welfare, ethics, law, arts, etc.
- The ability to consider and evaluate the impact of the technology on the society, public health and safety.
- The ability to appreciate and engage in social and entrepreneurial activities essential to the engineering practice and reflect on the management of the economics and social science.
- The ability to engage in life-long learning and respond effectively to the needs of the society.

### **B- MATHEMATICS AND BASIC SCIENCES MATHEMATICS**

- Acquiring knowledge in mathematical and analytical methods.
- The ability to reason about and conceptualize engineering components, systems or processes using analytical methods related to the discipline.
- The ability to analyze and model engineering components, systems and processes specific to the discipline.
- The skill of using probability and statistical methods.

### **BASIC SCIENCES**

- Acquiring knowledge of physics, chemistry, mechanics, earth sciences, biological sciences and other specific subjects which focus on understanding the physical world.
- The ability to select and apply scientific principles in practical problem solving.
- The ability to analyze, model and reason about engineering components, systems or processes using principles and knowledge of the basic sciences as applicable in each engineering disciplinary context.
- The ability to adopt scientific evidence-based techniques in problem solving.

### **C- BASIC ENGINEERING SCIENCES**

- Integrating knowledge and understanding of mathematics and physical sciences to develop basic engineering laws and concepts related to the discipline.
- The ability to extend knowledge and develop models and methods and use techniques, principles and laws of engineering sciences that lead to engineering applications across disciplinary boundaries.

## ACADEMIC STANDARDS

- The ability to deal effectively with numbers and concepts to identify/solve complex and open ended engineering problems.

### D- APPLIED ENGINEERING AND DESIGN

- Attaining knowledge of current practice, engineering codes and design techniques relevant to the discipline.
- The ability to apply engineering knowledge and creative, iterative and open ended procedures when conceiving and developing components, systems and processes.
- The ability to integrate engineering knowledge, engineering codes, basic and mathematical sciences in designing a component, a system or a process.
- The ability to work under stress, taking into account time, economy, health and safety, social and environmental factors and binding laws.

### E- COMPUTING AND ICT

- Attaining knowledge of ICT principles.
- The ability to use computers, networks and software to support engineering activity, and to enhance personal/team productivity.
- The ability to assess, use and validate results produced by packages and create software as required in discipline.
- The ability to use general ICT tools effectively.

### F- PROJECT AND PRACTICE

- Gaining the knowledge and experience of applying the different principles and techniques introduced in the program of study.
- The ability to work within defined constraints, tackle work which lacks a well-defined outcome or which has a wide range of possible solutions and exhibit creativity in dealing with unfamiliar real-life problems.
- The ability to investigate, plan and execute technical research specific to the discipline over an extended period of time; meeting deadlines and putting technical work in a social and commercial context.
- The ability to work in a team, search published sources of information, interprets technical data and analyzes and presents findings in various ways.

### G- DISCRETIONARY SUBJECTS



## ACADEMIC STANDARDS

- Attaining knowledge and understanding of subjects selected by the institution to identify its character and/or satisfy the needs of the society.
- The ability to recognize, appreciate and respond effectively to the needs of the society via utilizing the technical knowledge specific to the discipline.
- The ability to lead and motivate people as well as organize and control tasks, people and resources.