السيد الأستاذ الدكتور/ عميد الأكاديمية الحديثة للهندسة والتكنولوجيا بالمعادي

تحية طيبة وبعد،

في إطار التعاون المثمر والبناء بين الهيئة القومية لضمان جودة التعليم والاعتماد وأكاديميتكم الموقرة، وفي ضوء خطابكم بشأن طلب اعتماد المعايير الأكاديمية المرجعية لبرامج البكالوريوس في العلوم التالية:

١- هندسة الإلكترونيات وتكنولوجيا الاتصالات.

٢- هندسة التصنيع وتكنولوجيا الإنتاج.

٣- هندسة الحاسبات وتكنولوجيا المعلومات.

٤- هندسة العمارة وتكنولوجيا البناء

يرجى التفضل بالإحاطة بأنه قد تمت مراجعة وتحكيم المعايير الأكاديمية المرجعية المقترحة من أكاديميتكم، وقد تم اعتمادها من مجلس إدارة الهيئة رقم (١٤٣) بتاريخ ٥ يوليو ٢٠١٥، ومرسل لسيادتكم نسخة ورقية معتمدة من هذه المعايير.

وتفضلوا بقبول فائق الشكر والتقدير والاحترام،

رئيس مجلس إدارة الهيئة

٧/٩/٢٠١٥

أ.د/ يوهانس عيد

الهيئة القومية لضمان جودة التعليم والأعتماد
مكتب رئيس الهيئة
"الصـــــادر"
رقم (٩١٥) بتاريخ ١٢/٧/٢٠١٥

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Academic Reference Standards (ARS)

for

Electronic Engineering and Communication Technology B. Sc. Program

The Modern Academy for Engineering and Technology in Maadi

July 2015

1st Edition

Contents

Introduction

Electronics becomes more and more influential on the human society. The reason for this is that almost all electronic products are produced in huge quantities so interfering with every one's life. In addition, electronic subsystems become part of almost any industrial product nowadays. Beside the basic laws of physical sciences, mathematics, and basic engineering sciences, electronics engineering programs combine electronic engineering principles and traditional computer science with good practice in design and project management applied to technically demanding problems. Graduates will be well qualified to play a disciplined and innovative part in research and development across the IT and Electronics sector.

An electronics engineer should have strong background in basic science and basic mathematics and be able to use these tools in their own engineering field. He should employ necessary techniques, hardware, and communication tools for modern engineering applications. He also should be able to work in a multi-disciplinary environment, and follow and contribute to the developments in their own field recognizing the significance of lifelong learning.

Electronics engineering is a broad discipline that covers the fields of integrated electronic circuits, electronic data storage, high-speed computing, communications, signal processing, microwave, wave propagation and antenna, optoelectronics, automation,

automatic control and monitoring systems, circuit analysis, network analysis, digital signal processing, and microprocessors.

Programs of electronics engineering are designed to strike a balance between theoretical and laboratory experience and to impart fundamental and practical understanding of the principles required for a successful career in electronics engineering. This requires a solid core of foundation courses in physics, mathematics, computer science, and general engineering, which is also essential for lifelong learning. Concentration courses in Electronics Engineering (that integrate theory and laboratory wherever possible) cover electromagnetic, wave propagation and antenna, circuits, electronics, power electronic devices, digital logic design, computers, programming, computer networks, signal processing ,optoelectronics and communications. Courses of interest are electric machinery, power system, classical control, modern control, industrial electronics circuits, digital control techniques, robotics, mechatronics, biomedical systems and modern automation systems. The capstone senior thesis and industrial internship are also required. State-of the-art electronics engineering elective courses provide seniors and advanced undergraduates.

Graduates who followed one of electronics engineering programs are careered into jobs including manufacturers of mobile phones, telephone centrals, computers, antenna and radar systems, industrial control, home appliances, biomedical engineering,

networking companies, communication systems, and integrated circuits. Others have joined research groups in university and industry, the public service, and the teaching professions.

The Electronic Engineering and Communication Technology B. Sc. Program fulfills the NARS requirements of electronic engineering B. Sc. programs in addition to distinguished communication technology discretionary courses.

This academic reference standard for the Electronic Engineering and Communication Technology B. Sc. program is applicable for both of the two-semester study and credit hour study.

National Academic Reference Standards (NARS) for Engineering

Attributes of the Graduates

The graduates of the engineering programs should be able 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 and 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.

1. Knowledge and Understanding

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

1.1. Concepts and theories of mathematics and sciences, appropriate to the discipline.
1.2. Basics of information and communication technology (ICT).
1.3. Characteristics of engineering materials related to the discipline.
1.4. Principles of design including elements design, process and/or a system related to specific disciplines.
1.5. Methodologies of solving engineering problems, data collection and interpretation.

1.6. Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.
1.7. Business and management principles relevant to engineering.
1.8. Current engineering technologies as related to disciplines.
1.9. Topics related to humanitarian interests and moral issues.
1.10. Technical language and report writing.
1.11. Professional ethics and impacts of engineering solutions on society and environment.
1.12. Contemporary engineering topics.

2. Intellectual Skills

The graduates of the engineering programs should be able to:

2.1. Select appropriate mathematical and computer-based methods for modeling and analyzing problems.
2.2. Select appropriate solutions for engineering problems based on analytical thinking.
2.3. Think in a creative and innovative way in problem solving and design.
2.4. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.
2.5. Assess and evaluate the characteristics and performance of components, systems and processes.

2.6. Investigate the failure of components, systems, and processes.
2.7. Solve engineering problems, often on the basis of limited and possibly contradicting information.
2.8. Select and appraise appropriate ICT tools to a variety of engineering problems.
2.9. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.
2.10. Incorporate economic, societal, environmental dimensions and risk management in design.
2.11. Analyze results of numerical models and assess their limitations.
2.12. 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:

3.1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve engineering problems.
3.2. Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.
3.3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

3.4. Practice the neatness and aesthetics in design and approach.
3.5. Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.
3.6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.
3.7. Apply numerical modeling methods to engineering problems.
3.8. Apply safe systems at work and observe the appropriate steps to manage risks.
3.9. Demonstrate basic organizational and project management skills.
3.10. Apply quality assurance procedures and follow codes and standards.
3.11. Exchange knowledge and skills with engineering community and industry.
3.12. Prepare and present technical reports.

4. General and Transferable Skills

The graduates of the engineering programs should be able to:

4.1. Collaborate effectively within multidisciplinary team.
4.2. Work in stressful environment and within constraints.
4.3. Communicate effectively.

4.4. Demonstrate efficient IT capabilities.
4.5. Lead and motivate individuals.
4.6. Effectively manage tasks, time, and resources.
4.7. Search for information and engage in life-long self learning discipline.
4.8. Acquire entrepreneurial skills.
4.9. Refer to relevant literatures.

Curriculum Structure

Subject Areas	Percentage	Tolerance
Humanities and Social Sciences	11 %	9 - 12 %
Mathematics and Basic Sciences	21 %	20 - 26 %
Basic Engineering Sciences	21 %	20 - 23 %
Applied Engineering and Design	21 %	20 - 22 %
Computer Applications and ICT*	10 %	9 - 11 %
Projects* and Practice	9 %	8 - 10 %
Subtotal	93 %	92 - 94 %
Discretionary (Institution character-identifying) subjects	7 %	6 - 8 %
Total	**100 %**	**100 %**

* 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.

Academic Reference Standards (ARS) for Electronic Engineering and Communication Technology

The attributes of Electronic Engineering and Communication Technology program graduates

In addition to the general attributes of Engineering graduates, the Electronic Engineering and Communication Technology program graduate should 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's hardware, software, operating systems and interfacing.
5 - Design, operate and maintain digital and analog communication, mobile communication, coding, and decoding systems.
6 - Adapt to new telecommunication technologies.
7 - Analyze, design, and implement telecommunication systems.
8 - Deal with high frequency techniques.

9 - Analyze and solve problems in antennas, wave propagation, microwave circuits, radars, and Satellites.

10 - Planning and analyzing communication networks.

1. Knowledge and Understanding

In addition to the general knowledge acquired by Engineering graduates, Electronic Engineering and Communication Technology graduates must demonstrate knowledge and understanding of:

1.1. Elementary science underlying electronic engineering systems and information technology;

1.2. Basics of design and analyzing electronic engineering systems, while considering the constraints of applying inappropriate technology and the needs of commercial risk evaluation;

1.3. Principles of Analyzing and design of electronic circuits and components;

1.4. Principles of Analyzing and design of control systems with performance evaluation;

1.5. Biomedical instrumentation;

1.6. Communication systems

1.7. Coding and decoding techniques

1.8. Microwave applications

1.9. Antenna and wave propagation

1.10. Usage of optical fiber

1.11. Methods of fabrication of Integrated circuits

1.12. Analysis of signal processing
1.13. Optical communication systems
1.14. Satellite communications.
1.15. Wireless communication techniques.
1.16. One way and two ways communication systems.
1.17. Broadcasting, acoustic engineering, and television engineering.

2. Intellectual Skills

In addition to the intellectual skills acquired by Engineering graduates, the graduates of Electronic Engineering and Communication Technology program should be able to:

2.1. Develop innovative solutions for the practical industrial problems.
2.2. Plan, conduct and write a report on a project or assignment.
2.3. Analyze the performance of digital and analog communication, mobile communication, coding, and decoding systems.
2.4. Synthesize and integrate electronic systems for certain specific function using the right equipment.
2.5. Select appropriate technical methods to solve communication problems.
2.6. Analyze different parameters of digital communication systems.
2.7. Select optimum frequencies of digital and analog communication systems.

3. Practical and Professional Skills

In addition to the practical and professional skills acquired by Engineering graduates, the graduates of the Electronic Engineering and Communication Technology program must be able to:

3.1. Use appropriate mathematical methods or IT tools.
3.2. Practice computer programming for the design and diagnostics of digital and analog communication, mobile communication, coding, and decoding systems.
3.3. Use relevant laboratory equipment and analyze the results correctly.
3.4. Troubleshoot, maintain and repair almost all types of electronic systems using the standard tools.
3.5. Identify appropriate specifications for required devices.
3.6. Use appropriate tools to measure system performance.
3.7. Use appropriate devices to measure different parameters of communication systems.
3.8. Use laboratory equipment to design and implement high frequency measurements.
3.9. Troubleshoot, maintain, and repair different types of communication systems.

4. General and Transferable Skills

The graduates must be able to demonstrate general and transferable skills of engineering graduates.

Glossary

1. **Institution**

   A University, Faculty or higher institute providing education programs leading to a first university degree or a higher degree (Master or Doctorate).

2. **Attributes of the Graduates**

   Competencies expected from the graduates based on the acquired knowledge and skills gained upon completion of a particular program.

3. **National Academic Reference Standards (NARS)**

   Reference points designed by NAQAAE to outline/describe the expected minimum knowledge and skills necessary to fulfill the requirements of a program of study.

4. **Academic Standards**

   Reference points defined by an institution comprising the collective knowledge and skills to be gained by the graduates of a particular program. The academic standards should surpass the NARS, and be approved by NAQAAE.

5. **Subject Benchmark Statements**

   Guideline statements that detail what can be expected of a graduates in terms of the learning outcomes to satisfy the standards set for the program. They enable the outcomes to be

compared, reviewed and evaluated against agreed upon standards.

6. The Program

A set of educational courses and activities designed by the institution to determine the systematic learning progress. The program also imparts the intended competencies required for the award of an academic degree.

7. Intended Learning Outcomes (ILOs)

Subject-specific knowledge, understanding and skills intended by the institution to be gained by the learners completing a particular educational activity.. The ILOs emphasize what is expected that learners will be able to do as a result of a learning activity.

8. Knowledge and Understanding

Knowledge is the intended information to be gained from an educational activity including facts, terms, theories and basic concepts. Understanding involves comprehending and grasping the meaning or the underlying explanation of scientific objects.

9. Intellectual Skills

Learning and cognitive capabilities that involve critical thinking and creativity.. These include application, analysis, synthesis and evaluation of information.

10. Professional and Practical Skills

Application of specialized knowledge, training and proficiency in a subject or field to attain successful career development and personal advancement..

11. General and Transferable Skills

Skills that are not subject-specific and commonly needed in education, employment, life-long learning and self development.. These skills include communication, team work, numeracy, independent learning, interpersonal relationship, and problem solving... etc.

Academic Reference Standards (ARS)

for

Computer Engineering And Information Technology B. Sc. Program

The Modern Academy for Engineering and Technology in Maadi

July 2015

1st Edition

Contents

Introduction

Computer engineering (CE) is a discipline that embodies the science and technology of design, construction, implementation, and maintenance of software and hardware components of modern computing systems and computer-controlled equipment. Computer engineering has traditionally been viewed as a combination of both computer science (CS) and electrical engineering (EE). Computer engineering is a field that experiences effects from rapid technological development in different real life applications. Computer engineering programs use basic sciences, mathematics, engineering and electronics, physical and human sciences to provide new computer technologies and systems that make human applications easier, more productive, faster and also enjoyable to use.

A computer engineer is a person trained to be proficient in the design and implementation of computer systems, both hardware and software. He should essentially be able to design digital control circuitry and program it to function correctly. To perform these tasks, the computer engineer must be knowledgeable in related mathematics, physics sciences, electronics, communications, computer hardware and software, networking and other engineering concepts and systems. A proper level of expertise must be possessed through practicing the discipline concepts in solving problems of

real applications. This level of expertise should be permanently upraised by engaging in life-long learning processes.

Information Technology is very much an integrative discipline; it pulls together the IT pillars of databases, human-computer interaction, networking, programming, and web systems and uses a solid background in each of them to enable graduates to solve all types of computing and informational problems, regardless of their origin. As a discipline, IT emphasizes the pervasive themes of user centeredness and advocacy, information assurance and security, and the management of complexity through abstraction and modeling, best practices, patterns, standards, and the use of appropriate tools.

The Computer Engineering and Information Technology program integrate the Information technology discipline with the base of the Computer Engineering discipline. This integration emphasizes and supports the base of computer engineering program and adds to it the knowledge areas of the Information technology. This allows graduates to have strong base to work effectively in both fields.

The graduate of Computer Engineering and Information Technology B.Sc. Program may work in:

Private and governmental firms and agencies, where it is required to design, manufacture, operate, develop or maintain

computer systems or computer-controlled systems. He/ She may also work as a computer network engineer.

The computer engineering and information technology B.Sc. Program fulfills the NARS requirements of computer engineering B.Sc. programs in addition to distinguished information technology discretionary courses.

This academic reference standard for the computer engineering and information technology B.Sc. program is applicable for both of the two-semester study and credit hour study.

National Academic Reference Standards (NARS) for Engineering

Attributes of the Graduates

The graduates of the engineering programs should be able 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 and 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.

1. Knowledge and Understanding

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

1.1. Concepts and theories of mathematics and sciences, appropriate to the discipline.
1.2. Basics of information and communication technology (ICT).
1.3. Characteristics of engineering materials related to the discipline.
1.4. Principles of design including elements design, process and/or a system related to specific disciplines.
1.5. Methodologies of solving engineering problems, data collection and interpretation.

2.6. Investigate the failure of components, systems, and processes.
2.7. Solve engineering problems, often on the basis of limited and possibly contradicting information.
2.8. Select and appraise appropriate ICT tools to a variety of engineering problems.
2.9. Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.
2.10. Incorporate economic, societal, environmental dimensions and risk management in design.
2.11. Analyze results of numerical models and assess their limitations.
2.12. 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:

3.1. Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve engineering problems.
3.2. Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.
3.3. Create and/or re-design a process, component or system, and carry out specialized engineering designs.

3.4. Practice the neatness and aesthetics in design and approach.
3.5. Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.
3.6. Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.
3.7. Apply numerical modeling methods to engineering problems.
3.8. Apply safe systems at work and observe the appropriate steps to manage risks.
3.9. Demonstrate basic organizational and project management skills.
3.10. Apply quality assurance procedures and follow codes and standards.
3.11. Exchange knowledge and skills with engineering community and industry.
3.12. Prepare and present technical reports.

4. General and Transferable Skills

The graduates of the engineering programs should be able to:

4.1. Collaborate effectively within multidisciplinary team.
4.2. Work in stressful environment and within constraints.
4.3. Communicate effectively.

4.4. Demonstrate efficient IT capabilities.
4.5. Lead and motivate individuals.
4.6. Effectively manage tasks, time, and resources.
4.7. Search for information and engage in life-long self learning discipline.
4.8. Acquire entrepreneurial skills.
4.9. Refer to relevant literatures.

Curriculum Structure

Subject Areas	Percentage	Tolerance
Humanities and Social Sciences	11 %	9 - 12 %
Mathematics and Basic Sciences	21 %	20 - 26 %
Basic Engineering Sciences	21 %	20 - 23 %
Applied Engineering and Design	21 %	20 - 22 %
Computer Applications and ICT*	10 %	9 - 11 %
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Total	**100 %**	**100 %**

* 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.

Academic Reference Standards (ARS) for Computer Engineering and Information Technology

The attributes of Computer Engineering and Information Technology program graduates

In addition to the general attributes of Engineering graduates, the Computer Engineering and Information Technology program graduate should 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 - Tackle business problems using system analysis tools and techniques.

5 - Manage projects related to computer systems in diverse fields of applications.

6 - Implement phases of the computer system development life cycle, procurement and installation of hardware, software design, data manipulation and system operations.

7 - Appreciate knowledge of tools and techniques of system development and implementation involving data and network security aspects.
8 - Implement computer applications to support business needs including databases and network solutions.
9 - Conduct effectively user experience building to the use computer applications in various business domains.

1. Knowledge and Understanding

In addition to the general knowledge acquired by Engineering graduates, Computer Engineering and Information Technology program graduates must demonstrate knowledge and understanding of:

1.1. 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, signal processing, operating systems, real-time systems and reliability analysis.
1.2. Quality assessment of computer systems.
1.3. Related research and current advances in the field of computer software and hardware.
1.4. Technologies of data, image and graphics representation and organization on computer storage media.
1.5. Modern trends in the field of networking and data transmission widely used nowadays.

1.6. knowledge of fundamentals of programming and the construction of computer-based systems, data structures and algorithms, software engineering techniques and information retrieval.

1.7. Knowledge of methods for the construction of web-based materials and systems, design of internet-based systems.

1.8. Understand the broad context within computer information technology such as quality, reliability, enterprise, employment law, accounting and health.

2. Intellectual Skills

In addition to the intellectual skills acquired by Engineering graduates, the graduates of Computer Engineering and Information Technology program should be able to:

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

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

2.3. 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.

2.4. Identify symptoms in problematic situations.

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

2.6. Classify computer objects running on different system configurations.
2.7. Analyze data/ information to support activities of business system users
2.8. Organize information innovatively in a form appropriate to decision making process
2.9. Analyze, discuss and evaluate using various networking techniques
2.10. Give examples of Information technology systems problems, set goals towards solving them, observe results, reason and apply judgment.
2.11. Recognize the professional, moral and ethical issues of involved in the exploitation of Information Technology and be guided by their adoption, reflect on issues of professional practice within the discipline.

3. Practical and Professional Skills

In addition to the practical and professional skills acquired by Engineering graduates, the graduates of the Computer Engineering and Information Technology program must be able to:

3.1. Design and operate computer-based systems specifically designed for business applications.
3.2. Use appropriate specialized computer software, computational tools and design packages throughout the phases of the life cycle of system development;

3.3. Write computer programs on professional levels achieving acceptable quality measures in software development.
3.4. Conduct user support activities competently.
3.5. Build and run databases and integrate them with business processing requirements
3.6. Deploy tools for the implementation and documentation of databases, networks and computer-based systems.
3.7. Evaluate systems in terms of their quality and possible trade-offs, evaluate appropriate hardware and software solutions for given scenarios.
3.8. Make effective use of general IT facilities, plan and manage a project to complete within budget and schedule.

4. General and Transferable Skills

The graduates must be able to demonstrate general and transferable skills of engineering graduates.

Glossary

1. **Institution**

   A University, Faculty or higher institute providing education programs leading to a first university degree or a higher degree (Master or Doctorate).

2. **Attributes of the Graduates**

   Competencies expected from the graduates based on the acquired knowledge and skills gained upon completion of a particular program.

3. **National Academic Reference Standards (NARS)**

   Reference points designed by NAQAAE to outline/describe the expected minimum knowledge and skills necessary to fulfill the requirements of a program of study.

4. **Academic Standards**

   Reference points defined by an institution comprising the collective knowledge and skills to be gained by the graduates of a particular program. The academic standards should surpass the NARS, and be approved by NAQAAE.

5. **Subject Benchmark Statements**

   Guideline statements that detail what can be expected of a graduates in terms of the learning outcomes to satisfy the standards set for the program. They enable the outcomes to be

10. Professional and Practical Skills

Application of specialized knowledge, training and proficiency in a subject or field to attain successful career development and personal advancement..

11. General and Transferable Skills

Skills that are not subject-specific and commonly needed in education, employment, life-long learning and self development.. These skills include communication, team work, numeracy, independent learning, interpersonal relationship, and problem solving... etc.

Academic Reference Standards (ARS)

for

Architectural Engineering and Building Technology

B. Sc. Program

The Modern Academy for Engineering and Technology in Maadi

July 2015

1st Edition

Contents

Introduction

Engineers solve real-life problems. They find the best solution through the application of their knowledge, experience and skills. Engineers help to define and refine the way of life by providing innovative, higher-performance, safer, cleaner or more comfortable day-use facilities for human beings. They seek improvement through the processes of invention, design, manufacturing and construction.

The engineer's problem-solving complexity grows as the world's social and technological problems become more closely related. The engineering study provides the students with the advanced, effective, technology-based education justifying the expectations of the future of science and technology. It should also provide the technical understanding and problem-solving skills which allow coping with the challenges of tomorrow.

The discipline of architecture draws on knowledge and skills from the human and physical sciences, and the fine and applied arts. It addresses the accommodation of all human activity in all places under all conditions, understanding our place within differing physical, historical, cultural, social, political and virtual environments. Architecture proposes, forms, and transforms our built environment, and does so through an engagement with the spaces,

buildings, cities and landscapes in which we live. Architectural education is therefore rich, varied and by definition interdisciplinary.

While architectural education must be concerned with the constraints of the physical world and historical and cultural dimensions, it must also constantly adapt to a changing social, economic and environmental context nationally, regionally and internationally.

The Program of Architecture Engineering and Building Technology prepares the graduate to be proficient in the art, engineering, and technology of designing the built environment relative to the users social, psychological, and aesthetic needs

The Architectural Engineering and Building Technology B. Sc. Program fulfills the NARS requirements of architectural engineering B. Sc. programs in addition to distinguished building technology discretionary courses.

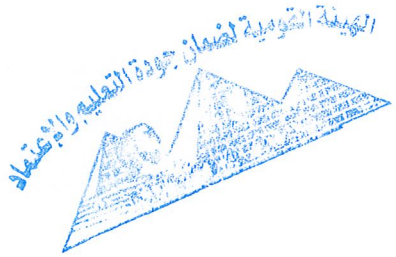
This academic reference standard for the Architectural Engineering and Building Technology B. Sc. program is applicable for both of the two-semester study and credit hour study.

National Academic Reference Standards (NARS) for Engineering

Attributes of the Graduates

The graduates of the engineering programs should be able 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 and 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.



1. Knowledge and Understanding

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

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

1.2. Basics of information and communication technology (ICT).

1.3. Characteristics of engineering materials related to the discipline.

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

1.5. Methodologies of solving engineering problems, data collection and interpretation.

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

1.7. Business and management principles relevant to engineering.

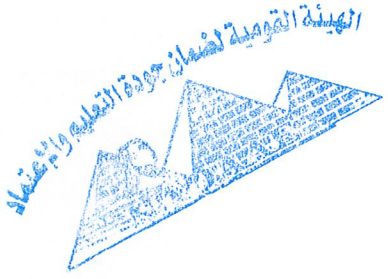
1.8. Current engineering technologies as related to disciplines.

1.9. Topics related to humanitarian interests and moral issues.

1.10. Technical language and report writing.

1.11. Professional ethics and impacts of engineering solutions on society and environment.

1.12. Contemporary engineering topics.



2. Intellectual Skills

The graduates of the engineering programs should be able to:

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

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

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

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

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

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

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

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

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

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

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

2.12. 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:

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

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

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

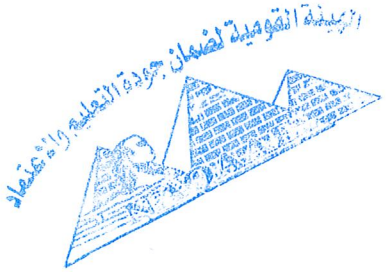
3.4. Practice the neatness and aesthetics in design and approach.

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

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

3.7. Apply numerical modeling methods to engineering problems.

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

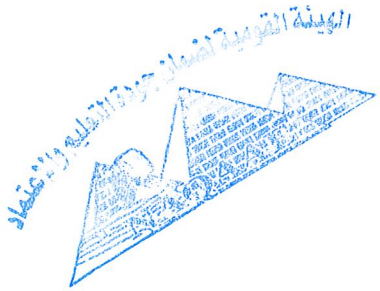


3.9. Demonstrate basic organizational and project management skills.
3.10. Apply quality assurance procedures and follow codes and standards.
3.11. Exchange knowledge and skills with engineering community and industry.
3.12. Prepare and present technical reports.

4. General and Transferable Skills

The graduates of the engineering programs should be able to:

4.1. Collaborate effectively within multidisciplinary team.
4.2. Work in stressful environment and within constraints.
4.3. Communicate effectively.
4.4. Demonstrate efficient IT capabilities.
4.5. Lead and motivate individuals.
4.6. Effectively manage tasks, time, and resources.
4.7. Search for information and engage in life-long self learning discipline.
4.8. Acquire entrepreneurial skills.
4.9. Refer to relevant literatures.



Curriculum Structure

Subject Areas	Percentage	Tolerance
Humanities and Social Sciences	11 %	9 - 12 %
Mathematics and Basic Sciences	21 %	20 - 26 %
Basic Engineering Sciences	21 %	20 - 23 %
Applied Engineering and Design	21 %	20 - 22 %
Computer Applications and ICT*	10 %	9 - 11 %
Projects* and Practice	9 %	8 - 10 %
Subtotal	93 %	92 - 94 %
Discretionary (Institution character-identifying) subjects	7 %	6 - 8 %
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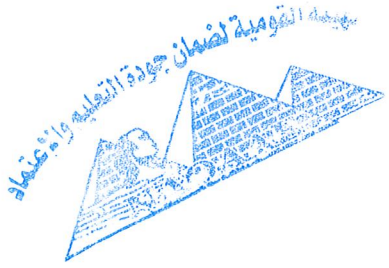
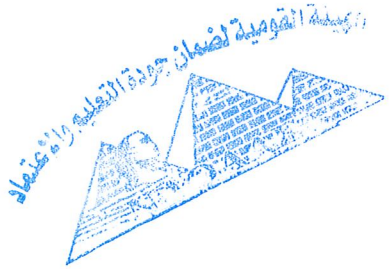


Academic Reference Standards (ARS) for Architectural Engineering and Building Technology

The attributes of Architectural Engineering and Building Technology program graduates

In addition to the general attributes of Engineering graduates, the Architectural Engineering and Building Technology program graduate should 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.
7 - Adopt new technologies, processes and strategies for the design and construction of buildings.



8 - Apply new materials and advanced manufacturing techniques in the field of building construction.

1. Knowledge and Understanding

In addition to the general knowledge acquired by Engineering graduates, Architectural Engineering and Building Technology graduates must demonstrate knowledge and understanding of:

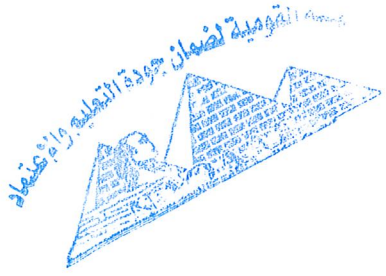
1.1. Principles of architectural design, and the preparation and presentations of design projects in a variety of contexts, scales, types and degree of complexity.

1.2. Principles of building technologies, structure & construction methods, technical installations, properties of materials, and the way they may influence design decisions.

1.3. Fundamentals of building acquisition, operational costs, and of preparing construction documents and specifications of materials, components, and systems appropriate to the building.

1.4. Theories and legislations of urban and regional planning.

1.5. The processes of spatial change in the built and natural environments; patterns and problems of cities; and positive & negative impacts of urbanization.



1.6. The significance of urban spaces and the interaction between human behavior, built environment and natural environment.

1.7. Theories and histories of architecture, planning, urban design, and other related disciplines.

1.8. Physical modeling, multi-dimensional visualization, multimedia applications, and computer-aided design.

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

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

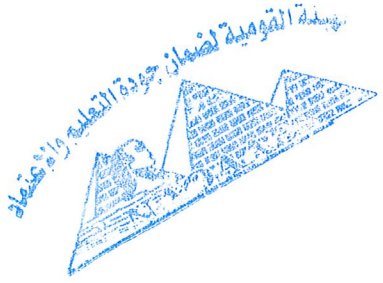
1.11. Principles of sustainable design, climatic considerations, and energy consumption and efficiency in buildings and their impacts on the environment.

1.12. The concepts, processes, techniques and materials that apply to building construction phases and technology.

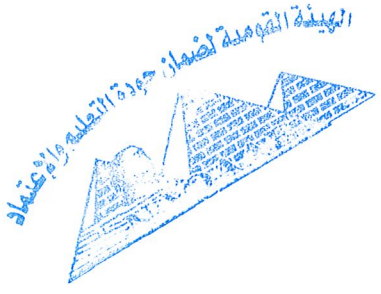
1.13. The concepts of standardization in the construction industry and quality management systems.

2. Intellectual Skills

In addition to the intellectual skills acquired by Engineering graduates, the graduates of Architectural Engineering and Building Technology program should be able to:



2.1. Integrate different forms of knowledge, ideas from other disciplines, and manage information retrieval to create new solutions.
2.2. Think three-dimensionally and engage images of places & times with innovation and creativity in the exploration of design.
2.3. Predict possible consequences, by- products and assess expected performance of design alternatives.
2.4. Reconcile conflicting objectives and manage the broad constituency of interests to reach optimum solutions.
2.5. Integrate relationship of structure, building materials, and construction elements into design process.
2.6. Integrate community design parameters into design projects.
2.7. Appraise the spatial, aesthetic, technical and social qualities of a design within the scope and scale of a wider environment.
2.8. Discuss, search and formulate informed opinions appropriate to specific context and circumstances affecting architecture profession & practice.
2.9. Analyze the range of patterns and traditions that have shaped and sustained cultures and the way that they can inform design process.
2.10. Identify different methods of building technologies and their impact on the built and social environment.

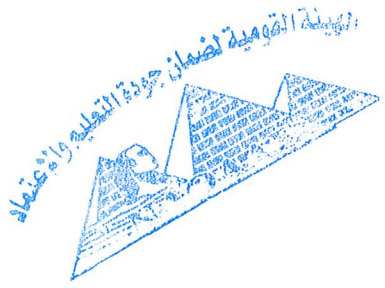


2.11. Indicate appropriate project management techniques that are related to building technology.
2.12. Select projects that comply with national and international building legislations, codes and by-laws.
2.13. Prepare reports of materials and technological methods used in buildings.

3. Practical and Professional Skills

In addition to the practical and professional skills acquired by Engineering graduates, the graduates of the Architectural Engineering and Building Technology program must be able to:

3.1. Produce and present architectural, urban design, and planning projects using an appropriate range of media and design-based software.
3.2. Produce professional workshop and technical drawings using traditional drawing and computer-aided drawings' techniques.
3.3. Use appropriate construction techniques and materials to specify and implement different designs.
3.4. Participate professionally in managing construction processes.
3.5. Demonstrate professional competence in developing innovative and appropriate solutions of architectural and urban problems.
3.6. Display imagination and creativity.



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

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

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

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

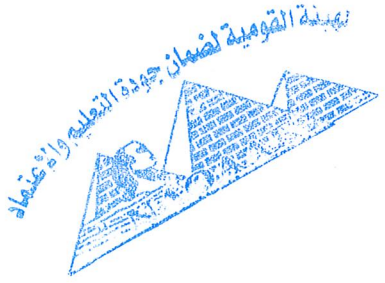
3.11. Apply recent advances in the fields of building materials, manufacturing and building technology to the construction of buildings.

3.12. Prepare working drawings that integrate multi-disciplinary standards and requirements of the construction process.

3.13. Demonstrate environmental studies that are applicable to building technology techniques and processes.

4. General and Transferable Skills

The graduates must be able to demonstrate general and transferable skills of engineering graduates.



Glossary

1. **Institution**

   A University, Faculty or higher institute providing education programs leading to a first university degree or a higher degree (Master or Doctorate).

2. **Attributes of the Graduates**

   Competencies expected from the graduates based on the acquired knowledge and skills gained upon completion of a particular program.

3. **National Academic Reference Standards (NARS)**

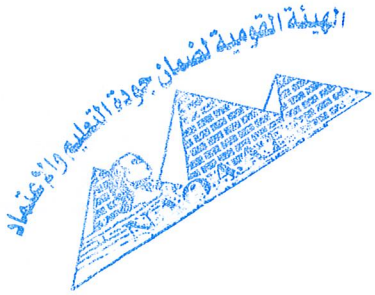
   Reference points designed by NAQAAE to outline/describe the expected minimum knowledge and skills necessary to fulfill the requirements of a program of study.

4. **Academic Standards**

   Reference points defined by an institution comprising the collective knowledge and skills to be gained by the graduates of a particular program. The academic standards should surpass the NARS, and be approved by NAQAAE.

5. **Subject Benchmark Statements**

   Guideline statements that detail what can be expected of a graduates in terms of the learning outcomes to satisfy the standards set for the program. They enable the outcomes to be



compared, reviewed and evaluated against agreed upon standards.

6. The Program

A set of educational courses and activities designed by the institution to determine the systematic learning progress. The program also imparts the intended competencies required for the award of an academic degree.

7. Intended Learning Outcomes (ILOs)

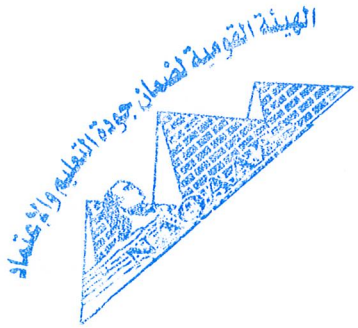
Subject-specific knowledge, understanding and skills intended by the institution to be gained by the learners completing a particular educational activity.. The ILOs emphasize what is expected that learners will be able to do as a result of a learning activity.

8. Knowledge and Understanding

Knowledge is the intended information to be gained from an educational activity including facts, terms, theories and basic concepts. Understanding involves comprehending and grasping the meaning or the underlying explanation of scientific objects.

9. Intellectual Skills

Learning and cognitive capabilities that involve critical thinking and creativity.. These include application, analysis, synthesis and evaluation of information.

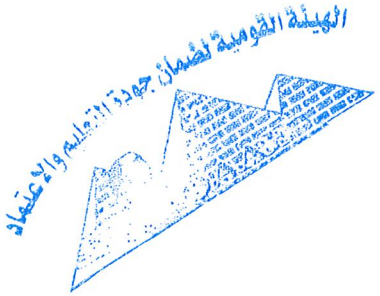


10. Professional and Practical Skills

Application of specialized knowledge, training and proficiency in a subject or field to attain successful career development and personal advancement..

11. General and Transferable Skills

Skills that are not subject-specific and commonly needed in education, employment, life-long learning and self development.. These skills include communication, team work, numeracy, independent learning, interpersonal relationship, and problem solving... etc.



Academic Reference Standards (ARS)

for

Manufacturing Engineering and Production Technology B. Sc. Program

The Modern Academy for Engineering and Technology in Maadi

July 2015

1st Edition

Contents

Introduction

Mechanical engineers should be curious about how things are made and work. They have a desire to solve problems and a talent for understanding the operation of mechanical devices. Mechanical engineers conceive, plan, design and direct the production, distribution and operation of a wide variety of devices, machines and systems, environmental control and materials processing, transportation and handling. Design and production mechanical engineers analyze their design using the principles of motion, energy, and momentum to insure that the product functions safely, efficiently, reliably, and manufactured at a competitive cost with minimized environmental hazards.

Mechanical engineering; design and production, is a broad discipline which covers the fields of solid and fluid mechanics, thermodynamics, engineering design, production technology, economics and management. Basic studies are devoted to mechanical properties of materials, machine design, dynamics and control, instrumentation, fundamentals of fluid flow, energy and power systems. Mechanical Engineering covers the design, analysis, testing and manufacturing of products that are used in every facet of modern society. Undergraduate educational programs in mechanical engineering design and production are specifically designed to provide a wide variety of topics. These include power systems, fluid and thermal sciences related to discipline, automatic control,

reliability, quality assurance and control, mechanical design and manufacturing.

A B.Sc. degree in design and production mechanical engineering is designed for students who seek careers as engineers in industry, army, consulting firms and private and governmental agencies. This degree is also appropriate for students who plan to be researchers or who intend to pursue an advanced degree in engineering. A typical program curriculum incorporates analytical tools, creative thought and diversity of skills as well as the state of art of the profession.

The graduate of Manufacturing Engineering and Production Technology B.Sc. Program may work in: private and governmental firms, where it is required to design, manufacture, operate, develop or maintain mechanical systems and equipment such as; industrial machinery, automotive, aerospace, power generation and air conditioning equipment.

The Manufacturing Engineering and Production Technology B.Sc. Program fulfills the NARS requirements of mechanical design and production engineering B.Sc. programs in addition to distinguished manufacturing technology discretionary courses.

This academic reference standard for the manufacturing engineering and production technology B.Sc. program is applicable for both of the two-semester study and credit hour study.

National Academic Reference Standards (NARS) for Engineering

Attributes of the Graduates

The graduates of the engineering programs should be able 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 and 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.

1. Knowledge and Understanding

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

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

1.2. Basics of information and communication technology (ICT).

1.3. Characteristics of engineering materials related to the discipline.

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

1.5. Methodologies of solving engineering problems, data collection and interpretation.

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

1.7. Business and management principles relevant to engineering.

1.8. Current engineering technologies as related to disciplines.

1.9. Topics related to humanitarian interests and moral issues.

1.10. Technical language and report writing.

1.11. Professional ethics and impacts of engineering solutions on society and environment.

1.12. Contemporary engineering topics.

2. Intellectual Skills

The graduates of the engineering programs should be able to:

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

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

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

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

Curriculum Structure

Subject Areas	Percentage	Tolerance
Humanities and Social Sciences	11 %	9 - 12 %
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Total	**100 %**	**100 %**

* 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.

Academic Reference Standards (ARS) for Manufacturing Engineering and Production Technology

The attributes of Manufacturing Engineering and Production Technology B.Sc. program graduates

In addition to the general attributes of Engineering graduates, the Manufacturing Engineering and Production Technology program graduate 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.

8 - Apply the principles of production processes with classic and up-to-date technologies in manufacturing and testing.
9 - Use advanced technologies and instrumentation in measurements and data analysis.
10 - Underlining the key roles of safety dimensions, sustainable technology, environmental friendliness, and cleaner production measures in manufacturing, materials, managerial and economic alternatives.
11 - Demonstrate the ability to design, develop, implement, and improve integrated systems that include people, materials, information, equipment and energy.

1. Knowledge and Understanding

In addition to the general knowledge acquired by Engineering graduates, Manufacturing Engineering and Production Technology graduates must demonstrate knowledge and understanding of:

1.1. Concepts, principles and theories relevant to Mechanical Engineering and manufacture.
1.2. The constraints within which his/her engineering judgment will have to be exercised.
1.3. The specifications, programming and range of application of CAD and CAD/CAM facilities.
1.4. Relevant contemporary issues in mechanical engineering.

1.5. Basic electrical, control and computer engineering subjects related to the discipline.
1.6. The role of information technology in providing support for mechanical engineers.
1.7. Engineering design principles and techniques
1.8. Management and business techniques and practices appropriate to engineering industry.
1.9. Advanced technologies for manufacturing, automation and product testing.
1.10. Computer numerically controlled machines used in manufacturing.
1.11. Impact of new manufacturing technologies on the society and environment.
1.12. New materials used in industry, their structures, mechanical properties, and modes of failure.

2. Intellectual Skills

In addition to the intellectual skills acquired by Engineering graduates, the graduates of Manufacturing Engineering and Production Technology program should be able to:

2.1. Apply the principles of mathematics, science and technology in problem solving scenarios in mechanical engineering;
2.2. Analyze and interpret data, and design experiments to obtain primary data;
2.3. Evaluate and appraise designs, processes and products, and propose improvements;

2.4. Interpret numerical data and apply analytical methods for engineering design purposes
2.5. Use the principles of engineering science in developing solutions to practical mechanical engineering problems.
2.6. Select appropriate manufacturing method considering design requirements.
2.7. Apply advanced and composite material technologies in production
2.8. Use efficiently appropriate methods of measurement.
2.9. Select effectively suitable joining technology appropriate to the production process.
2.10. Identify a range of solutions and critically evaluate and justify design solutions.

3. Practical and Professional Skills

In addition to the practical and professional skills acquired by Engineering graduates, the graduates of the Manufacturing Engineering and Production Technology program must be able to:

3.1. Prepare engineering drawings, computer graphics and specialized technical reports and communicate accordingly.
3.2. Employ the traditional and modern CAD and CAD/CAM facilities in design and production processes
3.3. Use workshop equipments competently and safely.

compared, reviewed and evaluated against agreed upon standards.

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