**Program Specification for Diploma in Computer Numerical Control (CNC) Machines**

**(New Bylaw)**

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| **Introduction:**The specification of this program provides a concise summary of the main features of the diploma of Computer Numerical Control (CNC) Machines. The student introduced to modern manufacturing processes including Computer Numerical Control (CNC) Programming, Computer Assisted Drafting (CAD) and Computer Assisted Manufacturing (CAM) software.Computer numerical control (CNC) technology uses machines to automate operations that are time consuming or may be inconsistent with conventional tools, such as drilling holes, cutting, milling, turning, grooving, and threading. These functions can be programmed into CNC machines, which cut away material from a solid block of metal, plastic, or glass to form a finished part design that meets precise specifications. Programming and operating CNC equipment requires specialized training in CNC technology.The intended learning outcomes (ILO’s) of the program are oriented to a typical student might reasonably understand them. It is also expected to achieve and demonstrate them. This provides full advantages of the learning opportunities that gained. This specification provides a source of information for students seeking for understanding the nature of the program and to all other interested parties. |

1. **Basic Information**
2. **Awarding Institution :** Benha University
3. **Teaching Institution :** Faculty of Engineering at Shoubra
4. **Name of the Final Award :** Diploma in Computer Numerical Control Machines
5. **Program Title:** Computer Numerical Control Machines
6. **Name of Department:** Mechanical Engineering Department
7. **Coordinator:** Prof. Dr. Hossam Zakria
8. **Language of study:** English
9. **Date of production of Program Specification :** June 2012
10. **Relevant Benchmarks:**
* Academic Standards NAQAAE, March 2009
* Glyndŵr University

**B:Professional Information**

**1. Program Mission and Aims**

**1.1 Program Mission**

The mission of the Faculty of Engineering, Benha University, Diploma of Mechanical Engineering Programs provided by the department is:

* To provide students with a technical basis in the key areas of the engineering profession through delivery of a theoretical information and practical applications of mechanical engineering science.
* To develop in our students excellences in oral and written communications.

**1.2 Program Aims**

In pursuit of this mission, the educational objectives of the Diploma in Mechanical Engineering Program in CNC Machines are:

1. Provide study which will be informed by the forefront of both the academic and professional elements of the CNC machines discipline.
2. Competently program or run pre-existing programs to operate CNC lathes and milling machines
3. Write basic CNC programs using G- and M- Codes
4. Utilize appropriate safety procedures while running machine shop equipment
5. Identify the appropriate cutting tool and materials for a given application
6. Communicate effectively with co-workers about machining issues
7. Function in the role of an entry-level CNC machinist in a variety of work settings
8. Provide scientific, technical and economic aspects of CNC machines elements.
9. Recognize the phenomena programming methods of CNC machines.
10. Enhance the methods of drawing and manufacturing with the aid of computer.
11. Promote the integrated manufacturing systems and manufacturing with the aid of computer.
12. Provide introduction for mechanical vibrations, projects plan and systems of flexible manufacturing.
13. Provide introductory study for jigs and fixtures design and methods of machines management.
14. Promote awareness to the study of manufacturing and production operations.
15. Produce professional CNC engineers to work in the field of mechanical engineering.

**2. Intended Learning Outcomes (ILOs)**

Upon completion of the program the students should be able to:

**2.1- Knowledge and Understanding:**

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| --- | --- |
| **Program ILO’s** | **Teaching / learning methods and strategies** |
| 2.1.1 Identify theories, fundamentals and specialized knowledge in the CNC and categorize sciences related to professional practice.2.1.2 List principles of professional practice in the area of CNCmachines.2.1.3 Describe principles and fundamentals of quality in professional practice in the area of computer numerical control machines.2.1.4 Explain the effect of professional practice on the environment and work towards its conservation and maintenance.2.1.5 Demonstrate methodologies and computer tools available for analysis and design of mechanical engineering systems; | * Lectures,
* Seminars,
* Directed reading,
* Reporting,
* Independent study.
* Practical applications.
 |
| **Assessment** | * Individual coursework:

Assignments, quizzes, reports,* Oral discussions,
* Final written examinations.
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**2-2. Intellectual Skills:**

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| --- | --- |
| **Program ILO’s** | **Teaching / learning methods and strategies** |
| 2.2.1 Discern and analyze the problems in the area of CNC machines and categorize them according to their priority.2.2.2 Solve CNCmachines problems in his/her profession.2.2.3 Critically and analytically read research papers and topics related to his/her area of CNCmachines.2.2.4 Assess the risks and hazards in professional practices.2.2.5 Make professional decisions in the light of available information.2.2.6 Evaluate data sources and make sound judgments in the absence of complete data;  | * Tutorial,
* Problem solving,
* Small group exercises,
* Brainstorming,
* Thesis preparation.
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| **Assessment** | * Coursework:

project reports, Project write-ups, Presentations, * Oral and written examinations,
* Final thesis discussion.
 |

**2-3. Professional and Practical Skills:**

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| **Program ILO’s** | **Teaching / learning methods and strategies** |
| 2.3.1 Apply professional skills in the area of CNC machines.2.3.2 Prepare professional reports.2.3.3 Plan and implement experiment design and evaluate testing | * Experiments,
* Demonstrations,
* Practical work,
* Laboratory visits, and
* Case studies.
 |
| **Assessment** | * Coursework :

exercises and reports, project reports and presentationslaboratory experimental write-ups, * The methodology demonstrated in the work for the thesis.
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**2-4. General and Transferable Skills:**

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| **Transferable skills** | **Teaching / learning methods and strategies** |
| 2.4.1 Communicate effectively using different means.2.4.2 Use information technology in order to serve the development of professional practice.2.4.3 Assess him/her-self and identify his/her own personal learning needs.2.4.4 Use different sources for obtaining information and knowledge.2.4.5 Work in a group and manage time effectively.2.4.6 Lead a team in familiar professional contexts.2.4.7 Conduct self-learning and continuous education practices. | * Presentations seminars
* Attendance of workshops or conferences or internal seminars.
* Writing scientific papers (compulsory before obtaining the degree).
* Thesis preparation.
 |
| **Assessment** | * Presentations seminars
* Attendance of workshops or conferences or internal seminars.
* Writing scientific papers (compulsory before obtaining the degree).
* Thesis preparation.
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1. **Academic Standards**

**3a- External References for Standard**

Academic Reference Standards for postgraduate study programs, in general, were prepared by the National Authority for Quality Assurance and Accreditation of Education, Egypt. These standards were translated for preparing these program specifications.

**3b-Comparison of Provision to External References**

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| --- | --- | --- | --- |
| **Attributes of current program graduates** | **Attributes of program graduates as per NAQAAE Requirements for Diploma programs, in general** | **Corresponding ILO's in Current Program which satisfy the NAQAAE Requirements for Diploma programs, in general** | **Codes for Courses that Satisfy the ILO’s** |
| 1.1 Apply the acquired knowledge in computer numerical control machines. | 1.1 Apply the acquired specialized knowledge in his/her professional practice. | **2.1.1****2.2.3****2.3.1****2.4.2** |  MED504 |
| 1.2 Identify professional problems and propose appropriate solutions for their problems. | 1.2 Identify professional problems and propose solutions for them. | **2.2.1****2.2.2****2.2.3****2.2.4****2.4.4** | MEP 509 |
| 1.3 Master professional skills and use the most appropriate technological tools in professional practice for improving teaching process. | 1. 3 Master professional skills and use appropriate technological tools in professional practice. | **2.2.3****2.3.1****2.3.2****2.4.2** | MED 508 |
| 1.4 Communicate and lead teams through systemic professional work. | 1. 4 Communicate and lead teams through systemic professional work. | **2.3.2****2.4.1****2.4.5****2.4.6** | MED 507 |
| 1.5 Make decisions in the light of available information. | 1. 5 Make decisions in the light of available information. | **2.2.4****2.2.5** | MED 503 |
| 1.6 Utilize available resources efficiency. | 1. 6 Utilize available resources efficiently. | **2.1.3****2.1.4****2.2.3****2.4.4** | MED 506 |
| 1.7 Display awareness of his/her role in community development and environmental conservation. | 1. 7 Display awareness of his/her role in community development and environmental conservation. | **2.1.3****2.1.4** | MED 505MEP 509 |
| 1.8 Act in a way that reflects his/her commitment to integrity and credibility, and accept accountability and taking responsibility for his/her action. | 1. 8 Act in a way that reflects his/her commitment to integrity and credibility, and accept accountability and taking responsibility for his/her action. | **2.1.2****2.2.4****2.4.5** | MED 503MED 507 |
| 1.9 Realize of the need to develop him/hers self and engage in continuous education. | 1.9 Realize of the need to develop him/hers self and engage in continuous education. | **2.4.2****2.4.3****2.4.7** | MEP 509 |

**3c-Gap Analysis:**

1. **- Knowledge and Understanding Skills :**

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| --- | --- | --- |
| **Benchmark ILOs****Glyndŵr University****Mechanical Engineering** | **ARS****(ILO's in Current Program)****(General)** | **Gap Analysis** |
| A1. Theoretical principles and application techniques; A3. Mathematical principles relevant to advanced concepts of mechanical engineering systems;  | 2.1.1 Identify theories, fundamentals and specialized knowledge in the field of specialization and categorize sciences related to professional practice. |  |
|  | 2.1.2 List ethical and legal principles of professional practice in the area of specialization. | positive |
| A2. Current problems, being treated in a critical and evaluative manner;  | 2.1.3 Current problems, being treated in a critical and evaluative manner;  |  |
|  | 2.1.4 Explain the effect of professional practice on the environment and work towards its conservation and maintenance. | positive |
| A4. The range of methodologies and computer tools available for analysis and design of mechanical engineering systems; | 2.1.5 Demonstrate methodologies and computer tools available for analysis and design of mechanical engineering systems; |  |

**Conclusions:**

In the Knowledge and Understanding Skills of this program; there is positive gap (2.1.4), and high correspondence with little variations due to the difference in the environmental conditions.

1. **- Intellectual Skills:**

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| **Benchmark ILOs****Glyndŵr University** | **ARS****(ILO's in Current Program)** | **Gap Analysis** |
| B1. Apply advanced engineering principles to the solution of design and operation problems and the investigation of new and emerging technologies in mechanical and manufacturing systems;  | 2.2.2 Solve specialized problems in his/her profession. |  |
| B2. Plan, conduct and report on an original program of work (dissertation);  | 2.2.3 Critically and analytically read research papers and topics related to his/her area of specialization |  |
| B3. Analyze complex engineering issues in both a systematic and a creative way;  | 2.2.1 Discern and analyze the problems in the area specialization in both a systematic and a creative way;  |  |
| B4. Evaluate data sources and make sound judgments in the absence of complete data;  | 2.2.6 Evaluate data sources and make sound judgments in the absence of complete data;  |  |
| B5. Make sound decisions in complex and unpredictable situations, both familiar and unfamiliar. | 2.2.5 Make sound decisions in complex and unpredictable situations. |  |
|  | 2.2.4 Assess the risks and hazards in professional practices. | positive |

**Conclusions:**

In the Intellectual Skills of this program; there is positive gap (2.2.4), and high correspondence with little variations due to the difference in the environmental conditions.

1. **- Professional and Practical Skills:**

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| --- | --- | --- |
| **Benchmark ILOs****Glyndŵr University** | **ARS****(ILO's in Current Program)** | **Gap Analysis** |
| C1. Demonstrate self-direction and originality in tackling and solving mechanical engineering systems problems;  | 2.3.1 Apply professional skills to solve problems in the area of specialization | - |
| C2. Prepare in-depth reports at a professional level; | 2.3.2 Prepare professional reports. | - |
| C3. Act autonomously in planning and implementing experiment design and evaluative testing;  | 2.3.3 Plan and implement experiment design and evaluate testing | - |

**Conclusions:**

In the professional and practical Skills in this program; there is no gap, and high correspondence with little variations due to the difference in the environmental conditions.

1. **- General and Transferable Skills:**

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| --- | --- | --- |
| **Benchmark ILOs****Glyndŵr University** | **ARS****(ILO's in Current Program)** | **Gap Analysis** |
| D1. Exercise initiative and personal responsibility;  | 2.4.3 Identify personal learning needs2.4.5 Work in a group and manage time effectively.2.4.6 Lead a team in familiar professional contexts. | - |
| D2. Communicate clearly to specialist and non-specialist audiences;  | 2.4.1 Communicate effectively using different means with different audiences. | - |
| D3. Select and apply mathematical methodologies in the interpretation of problems and evaluation of solutions;  |  | negative |
| D4. Exercise judgment in the use of information technology - to source information and to model performance using specialized software packages, with awareness of the limitations computer models used in mechanical engineering applications;  | 2.4.2 Use information technology to model performance using specialized software packages in order to serve the development of professional practice.2.4.4 Use different sources for obtaining information and knowledge | - |
| D5. Apply the independent learning ability required for continuing professional development; | 2.4.7 Conduct self-learning required for continuous professional development. | - |

**Conclusions:**

In the general and transferable Skills in this program; there is negative gap but this gab is embedded in the intellectual and the professional skills, and high correspondence with little variations due to the difference in the environmental conditions.

1. **Program Structure and Award Requirements**
2. **Curriculum**

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| --- | --- | --- | --- | --- | --- |
| **Test Time** | **Grades** | **Credit Hours** | **Course Name** | **Course Code** | **Serial** |
| **Total** | **Written Exam** | **Oral or Practical** | **Course Work** |  |  |
| **Compulsory Courses** |
| **3** | **300** | **120** | **90** | **90** | **3** | **CNC Machines and their Economics**  | **MED 503** | **1** |
| **3** | **300** | **120** | **90** | **90** | **3** | **CNC programming** | **MED 504** | **2** |
| **3** | **300** | **120** | **90** | **90** | **3** | **Computer aided manufacturing** | **MED505** | **3** |
| **3** | **300** | **120** | **90** | **90** | **3** | **Project** |  | **4** |
| **Elective Courses** |
| **3** | **300** | **120** | **90** | **90** | **3** | Machining operations | **MED506** | **1** |
| **3** | **300** | **120** | **90** | **90** | **3** | **Computer integrated production systems** | **MED507**  | **2** |
| **3** | **300** | **120** | **90** | **90** | **3** | **Non-conventional machining** | **MED508** | **3** |
| **3** | **300** | **120** | **90** | **90** | **3** | **Engineering software** | **MEP 509** | **4** |

* To join this program the student should complete a minimum of 9 credit hours of preparatory courses with a grade point average not less than (C+).
* Total number of required credit hours is 18 hours. The studied subjects should have a code 500. To obtain the diploma, the student should achieve grade point average not less than (C).

**2. Criteria for Admission:**

Faculty of engineering graduates, practical faculties graduates, or graduates of any other institute accredited by the Egyptian Supreme Council of Universities are admitted to the Diploma program. Further details of the admission criteria are outlined in the internal postgraduate prospectus for the Faculty of Engineering at Shoubra, issued 2000-2001 (in Arabic).

**3. Regulation for Progression and Programme Completion**

Different rules pertaining to the progression and completion of the degrees are outlined in the internal postgraduate prospectus for the Faculty of Engineering at Shoubra, issued 2000-2001 (in Arabic).

**4. English Language Requirement:**

The English language proficiency of all students shall be tested in accordance with the university requirements.

**5. Role of External Examiner**

External examiners (from other universities and research institutes) are nominated by the main supervisor of the student and approved by the department. Their duties include revising the final manuscript of the student dissertation or thesis and indicating if the reported work is up to the standard. Subsequently a viva-voce examination is held where the examiner get the opportunity to question the student regarding his work**.**

1. **Support for Students and their Learning:**
2. The postgraduate office staff helps the students with any inquiries regarding faculty regulations related to postgraduate programs.
3. An open door policy is exercised whereby students can inform head of department of any complaints or requests either verbally or in writing.

After completing the courses each student is assigned with a panel of supervisors (either faculty members or members of other faculties) to help the student with undertaking the research work.

**7- Program Matrix:**

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| --- | --- | --- | --- | --- |
| **Course Code** | **Knowledge & Understanding** | **Intellectual Skills** | **Professional Skills** | **General and Transferable Skills** |
| **2.1.1** | **2.1.2** | **2.1.3** | **2.1.4** | **2.1.5** | **2.2.1** | **2.2.2** | **2.2.3** | **2.2.4** | **2.2.5** | **2.2.6** | **2.3.1** | **2.3.2** | **2.3.3** | **2.4.1** | **2.4.2** | **2.4.3** | **2.4.4** | **2.4.5** | **2.4.6** | **2.4.7** |
| MED503 | • | • | • |  |  | • |  |  | • |  |  |  | • |  |  | • |  |  | • | • |  |
| MED504 | • | • |  |  |  | • | • |  | • |  |  |  | • |  |  | • |  |  | • | • | • |
| MED505 | • |  | • |  |  |  | • | • | • |  |  | • | • |  | • |  |  | • |  | • |  |
| MED506 |  |  | • | • |  | • |  | • | • |  |  | • |  |  |  | • |  | • |  | • |  |
| MED507 | • | • | • | • |  |  |  |  | • | • |  |  | • |  | • | • | • |  | • |  |  |
| MED508 |  | • |  | • |  | • |  | • |  | • |  | • | • |  | • | • |  |  | • | • | • |
| MEP509 | • |  | • |  |  |  | • | • | • |  |  | • |  |  | • | • |  | • |  | • |  |

**Program coordinator:** Prof. Dr. Hossam Zakria

**Head of department:** Prof. Dr. Osama Ezzat