

## **Accreditation Report**

Accreditation of

**German University in Cairo**

**“Mechatronics Engineering” (B.Sc./M.Sc.)**

### **I Procedure**

**Date of Contract:** January 22<sup>nd</sup>, 2013

**Receipt of self-evaluation report:** January 8<sup>th</sup>, 2013

**Date of the on-site visit at the GUC:** September 29<sup>th</sup>-30<sup>th</sup>, 2013

**Standing Expert Committee:** Standing expert committee “Engineering”

**Attendance by the ACQUIN Office:** Marion Moser, Clemens Bockmann

**Accreditation:** 2<sup>nd</sup> December 2013, 30<sup>th</sup> September 2014.

#### **Members of the Peer Group:**

- **Prof. Dr. Reiner Dudziak** (assessment on the basis of the evaluation self-report), Bochum University of Applied Sciences, Faculty of Mechatronics and Mechanical Engineering
- **Dr. Sc. ETH Zürich Markus Grebenstein**, Head of Department German Aerospace Center, Institute of Robotic and Mechatronics, Mechatronic Components and Systems
- **Philipp Hemmers**, Student Mechanical Engineering at the RWTH Aachen.
- **Prof. Dr. techn. Klaus Janschek**, Technische Universität Dresden, Faculty of Electrical and Computer Engineering, Chair of Automation Engineering

The **Evaluation report** of the peer group is based on the self-evaluation report of GUC and extensive discussions with the President, the head of the study programme, staff representatives (lecturers), students.

**Evaluation Criteria** have been the “Kriterien des Akkreditierungsrates für die Akkreditierung von Studiengängen” in the actual official version.

**Content**

<b>I</b>	<b>Procedure .....</b>	<b>1</b>
<b>II</b>	<b>Introduction .....</b>	<b>3</b>
1	Short Profile of the Higher Education Institution (HEI) .....	3
2	The Programmes in its Faculties Framework.....	4
<b>III</b>	<b>Evaluation .....</b>	<b>5</b>
1	Targets of GUC and the Faculty of Engineering and Materials Science .....	5
2	Target and Concept of the Bachelor in Mechatronics Engineering .....	6
2.1	Qualification Targets.....	6
2.2	Admission Criteria & Demand of the Programme.....	7
2.3	Concept.....	7
2.4	ECTS & Modularization .....	9
2.5	Teaching Methods.....	10
3	Target and Concept of the Master in Mechatronics Engineering .....	10
3.1	Qualification Targets.....	10
3.2	Admission Criteria & Demand of the Programme.....	11
3.3	Concept.....	11
3.4	ECTS & Modularization .....	12
3.5	Teaching Methods.....	12
4	Implementation.....	13
4.1	Resources.....	13
4.2	Organization & Cooperation .....	14
4.3	Examination System.....	14
4.4	Documentation and Transparency.....	15
4.5	Gender Equity and Compensation Opportunities for Disabled People .....	16
5	Quality Management.....	16
6	Summary .....	17
<b>IV</b>	<b>Decisions of the accreditation commission of ACQUIN .....</b>	<b>18</b>
1	Accreditation Decision .....	18
2	Fulfilment of Conditions .....	20

## **II Introduction**

### **1 Short Profile of the Higher Education Institution (HEI)**

The German University in Cairo (GUC) was founded in 2002. It is an Egyptian private university and is established under the patronage of the University of Ulm and the University of Stuttgart. GUC opened its gates to students in October 2003.

GUC consists of seven faculties: The Faculty of Pharmacy and Biotechnology, the Faculty of Engineering and Materials Science, the Faculty of Information Engineering and Technology, the Faculty of Management Technology, the Faculty of Media Engineering and Technology, the Faculty of Postgraduate Studies and Scientific Research, and the Faculty of Applied Sciences and Arts. For the future the establishment of a Faculty of Basic Sciences and of a Faculty of Human Sciences and Languages is planned.

GUC wants to be a centre of excellence in teaching and research that will serve diversified constituencies and evolves as a model for higher education. So GUC aims to provide a high quality state-of-the-art education which meets the needs of the students, employers nationally and internationally. GUC also develops its position as a leader in selected academic programs and in scientific research.

The teaching language at GUC is English; while German is taught in addition to allow the exchange of GUC students with German universities and to facilitate their training in German companies.

In order to establish international compatibility and to facilitate academic recognition according to European standards, the European Credit Transfer System (ECTS) is used at GUC.

The number of students in the 1<sup>st</sup> admission intake in 2003 was 956 students. The number of students in the admission intake in 2012 was 2147 students. The total of currently enrolled students in undergraduate programs is 8249. The increase in total enrolment reflects the growing reputation of GUC as well as high demand for its study programs. In addition, the overall average final High School Score of the newly admitted students is 95% over the last 5 years which reflects the high quality of the students joining GUC. The increasing number of students offered scholarships from 69 students in 2003 to 929 in 2012 reflects the socially balanced policy of GUC.

The Faculty of Postgraduate Studies and Scientific Research started on 30/07/2003 being the only Postgraduate & Research Faculty of a Private University in Egypt awarding M.Sc. and Ph.D. degrees. The total number of students and graduates registered in the M.Sc. program on 31/09/2012 is 630, of which 256 students graduated and 374 students in progress, while the

total number of students registered in the PhD program is 77 of which 25 graduated and 52 in progress.

The total number of staff (including academics and administrative staff) is 1364. The total number of academic staff is 542.

## **2 The Programmes in its Faculties Framework**

The Faculty of Engineering and Materials Science (EMS) offers the following Bachelor programmes and consecutive Master programmes:

- Materials Engineering Program
- Design and Production Engineering Program
- Mechatronics Engineering Program
- Civil Engineering Program
- Architecture Engineering Program

The EMS is divided into three departments: the Department of Materials Engineering (MATS), the Department of Design and Production Engineering (DPE), and the Department of Mechatronics Engineering (MCTR). Currently, the number of academic staff members in the EMS is 64 staff members (24 PhD holders and 40 Teaching Assistants out of which 21 are GUC graduates).

### III Evaluation

#### 1 **Targets of GUC and the Faculty of Engineering and Materials Science**

GUC representatives declared explicitly that GUC understands itself as a scientific, research oriented university. The Vision of the GUC is to build “a leading centre of excellence in teaching and research that will effectively contribute to the general welfare nationally and internationally and endeavour the scientific, technical, economic and cultural cooperation between Egypt and Germany.” In its mission statement GUC emphasises especially the international collaboration with Germany on the academic level and beyond.

A board of external peer reviewers helps GUC to keep focus on the strategic goals of the university, which is highly appreciated.

GUC has a remarkable and growing number of applicants in recent years (almost 16.000 this year). Nevertheless, the university does not exceedingly raise the number of students (approx. 2100 freshmen in 2013). The peer group is convinced that the university is capable to increase resources appropriately according to the growing number of students. The number of drop-outs is remarkably low e.g. in comparison to German universities (the given drop-out rate of 0.8% is a yearly drop-out rate). Nevertheless, the peer group is assured that the low drop-out is not related to unbalanced grading but to the high qualification of the relatively small portion of students accepted in a highly selective qualification process (see below).

The strategic goals of GUC in terms of mechatronics can be grouped in two categories. On one hand GUC aims to be an internationally high ranked research university. Hence, e.g. there is a strong focus on education in writing research papers even in lower semesters. Consequently, there is a remarkable amount of national and international research papers published by undergraduate students in recent years. On the other hand GUC students should be highly coveted employees for national as well as international companies.

The goals of GUC are strongly subsidized by the board but in eyes of the peer group the research goals of the Faculty of EMS, ranging from electro-hydraulics to medical robotics and autonomous navigation of UAVs, are too widespread to develop the expertise necessary to compete on an international level of research. The peer group strongly recommend GUC to focus on a reduced number of research topics in mechatronics to enable the researchers to develop high level expertise on an international standard. It obviously would be advantageous to select topics that already have a high maturity level on one hand and that, on the other hand, enable technology transfer to Egyptian industry and ensure a high demand of the industry for GUC graduates, such as electro-hydraulics. Furthermore, it is advantageous to select research topics that

can develop in depth knowledge synergistically. Last but not least, the peer group would appreciate additional efforts in postgraduate research.

According to the investigation of the peer group for the development of both study programmes “Mechatronics Engineering”, GUC uses legal restrictions of the Egyptian educational system as well as the regulations of the German Accreditation Council.

## **2 Target and Concept of the Bachelor in Mechatronics Engineering**

### **2.1 Qualification Targets**

The study objectives of the both the bachelor and the master programme are directed towards knowledge and skills to design and analyse the engineering systems for better operation, performance and control and to pursue further studies and research nationally and internationally. Graduates of the bachelor programme will have the ability to apply mathematics, physics, mechanics and electronics to solve engineering and industrial problems. They will have developed technical expertise in mechanical design, computer-aided design, robotics as well as manufacturing technology. In addition, they will develop technical expertise in digital design, microcontroller operation, interfacing, and programming, sensors, actuators, drive systems, control theory and data communication.

The competencies that the graduates of this bachelor programme acquire are well defined and cover knowledge of mathematics, science, technical knowledge and mechatronics engineering, abilities like conducting, analysing and interpreting experiments or designing components and systems that integrate computers, sensors and actuators in mechanical systems, and soft skills like communicating technical matters effectively in oral, written and graphical forms to professionals or public audiences. In addition there is the possibility to acquire knowledge in German as second foreign language (English being the first). The objectives of the bachelor programme defined above fully meet international scientific standards.

Given the strong international focus of GUC towards Germany, the students have to deal with a different cultural area. The contact with different values, methods, and strategies stimulates the reflection of own values and certainties and leads to a matured personality. The peer group could see that the students do not only engage rigorously in their academic studies, but in civil activities as well. Several students associations care for the civil society. GUC fosters these processes.

Regarding the employability of graduate students GUC has a strong focus on the local industry, in particular within the bachelor. This is emphasized by the fact that courses in the field of electro-hydraulics are lectured by employees of the local steel industry. To reach the goal of employability, GUC students spend 15% to 20% of their time on practical and job related topics. The

experiences of the alumni network activities are included in the programme development. The peer group is convinced that the profile of GUC students fits the demands of the Egyptian job market.

## **2.2 Admission Criteria & Demand of the Programme**

Although expanding capacities, GUC cannot admit all applicants. In fact, the number of applicants exceeds the number of student places by the factor five. According to state regulation the admission to GUC is based on the marks of the school record only. The applicants are screened on base of their online application and then subjected to a standardised admission test. Academic qualifications for GUC admission are Abitur, American Diploma International General Certificate of Secondary Education, Egyptian Thanaweya Amma & Thanaweya Azhareya, Thanaweya Amma from Arab countries, and the International Baccalaureate. Furthermore, to state the eligibility of a student for a particular study group, certain qualifying subjects are required. For the engineering study programmes, these qualifying subjects are English, mathematics, physics, and chemistry.

The admission procedure is both deliberate and elaborate. The key indicators gathered by GUC in this field over the past admission periods prove that the admission process is effective. This is considered one reason for the astonishingly low drop-out rates in the course of the study programs. Due to its attractiveness GUC is able to select the top five percent of each year – or even better. The admission procedure appears to be fair, transparent and does not discriminate against certain groups

## **2.3 Concept**

The bachelor and master programme “Mechatronics Engineering” of GUC must be understood in the context of the Egyptian study system. Albeit the differences between „Egyptian“ and „International“ degrees might be obvious to local students and employers, the distinction of these should be made more clearly to international stakeholders. The classical Egyptian engineering degree is a five-year Egyptian bachelor in engineering (similar to the German five-year Diplomstudium) and it is the regular graduation grade (stated by Egyptian law) required for admission to the Chamber of Engineers. Therefore, for reason of employability, some variances to the European standard are required.

The International Bachelor programme in “Mechatronics Engineering” offered by GUC consists of eight semesters (finishing degree is a Bachelor of Science in Engineering and Materials Science; Major Mechatronics) enabling the students to enter a subsequent three-semester international master programme (at present only open to GUC graduates). Finishing degree is a Master of Science in Mechatronics Engineering. Both International Bachelor and Master degrees will enable GUC graduates to move directly to international follow-on programs (master, PhD) and

therefore matches international compatibility. On the other hand having passed at least the first-year international master will qualify the students for the Egyptian Bachelor degree and thus ensuring employability at the national market.

The first year of the bachelor “Mechatronics Engineering” is common to all engineering programs and covers fundamentals of mathematics, physics, computer sciences, chemistry, engineering drawing, etc. At the beginning of the third semester the students can choose one-out-of-three majors – Materials Engineering, Design & Production Engineering, and Mechatronics Engineering. In general, this approach has the potential for a broad and sound educational basis. Furthermore it offers a more informed branching into specialized fields after having acquired a basic knowledge on the different subjects. On the other hand, it lacks flexibility and cannot focus on basics that are more essential to mechatronics than for the other bachelor programmes. For the current mechatronics programme under evaluation the considerable large amount of chemistry (6 weekly contact hours) could be filled partially with more mechatronic like topics, but GUC representatives have reported that this amount is required by ministry (if reducible, a reduction by 50% should be envisaged; a substitution for materials would be even more appropriate).

The curriculum of the bachelor “Mechatronics Engineering” is split in the following areas: 13% mathematics, 8% natural sciences, 26% mechanical engineering, 13% electrical engineering, 15% systems engineering, 14% computer science & information technology and 11% others. This is a reasonable mix, only the percentage of electrical engineering could be increased to considerably strengthen the mechatronics profile.

The bachelor curriculum contains only compulsory modules, no elective modules are offered, i.e. no topical specialization is possible for the students. This is not really a drawback and it is comparable to other international bachelor programmes, however GUC could evaluate if some electives at 7th semester bachelor level could perhaps give some space for topical specialization (e.g. more mechanical, more electrical, more IT). Moreover this would offer an easy way for getting additional space for implementing important electrical engineering topics that are not covered adequately in the programme:

- Electromagnetic fields are covered only partially in module ELCT 708 “Electric Machines” that provides very few content in terms of magnetic fields. A sound understanding of electromagnetic interdependencies including electrostatic phenomena (capacitive coupling) is mandatory for mechatronic systems. The existing module COMM 402 “Electromagnetics” should therefore be used and slightly adapted for this purpose.
- The general topic modelling and simulation, in particular multi-physics aspects, is fundamental for mechatronic system analysis and design. This topic is covered in several modules. Yet, the peer group could not get evidence that all fundamental aspects like multi-



physics modelling (energy- vs. port-based), algorithmic treatment of mathematical models (ODE vs. DAE) in context with their physical application and state-of-the-art software tools are covered in a coordinated and comprehensive manner. As model-based working is the fundamental paradigm for mechatronics GUC should establish either a dedicated module on modelling and simulation or running a coordinated action for harmonization and possibly update of the existing relevant modules.

Little practical work for basic electrical engineering, i.e. electric machines, power electronics, and digital logic, is offered. Discussing this issue with the lectures the peer group was informed that approx. 15-20% of the bachelor programmes' workload can be attributed to practical work, but is not specially documented. In the peer group's opinion this issue is worth more attention.

The module HUMA 402 "Research Paper Writing" is highly appreciated by the peer group, however this module is integrated at an early stage of the study programme (4<sup>th</sup> semester) and with too much distance to the self-dependent thesis writing (8<sup>th</sup> semester). A more appropriate appearance would be in the 6<sup>th</sup> or 7<sup>th</sup> semester. The peer groups' impression is fully confirmed by student's opinions.

The 8<sup>th</sup> semester consists of an industrial practical training (internship) of at least three months and the bachelor thesis afterwards. The bachelor thesis module consists of the thesis of three month (12 credit points) and a colloquium (3 credit points). As the internship is credited with 15 credit points the students must monitor their internships' activities also in an internship report. It is a suitable practice for the students not only to write, but also present this report. Therefore, the students should give a presentation of the results of their internship report.

For future consideration, courses in "principles of mechatronics" and "mechatronic components" would be of advantage.

Besides these few remarks, the curriculum of the bachelor "Mechatronics Engineering" is in good shape and meets international standards. The requirements on bachelor level are fulfilled.

## **2.4 ECTS & Modularization**

The bachelor "Mechanics Engineering" consists of 50 modules ranging von 2 credit points (Soft skills) up to 15 credit points (Internship and Bachelor Thesis). The distribution of credit points per semester is not equal (between 27 and 32 CP, nominal 30 CP). A further harmonization should be fostered. The allocation of credit points vs. weekly contact hours seems somewhat formal and non-transparent. In most cases these two numbers are just equal; in some cases the number of credit points is a little bit larger than the number of weekly contact hours. If practical, a more detailed workload analysis and possibly an adaption of credit points would enhance the bachelor programme.

## 2.5 Teaching Methods

All students have access to digital databases, which is very much appreciated. In the compulsory bachelor module HUMA 402 “Research Paper Writing” this access and active bibliographic working is part of the educational process, which is also very much appreciated.

GUC has implemented a remarkable standard of industrial level laboratory infrastructure relevant for mechatronics, in particular the industrial park. This offers an excellent potential for educational purposes and as far the peer group got visibility the practical work is implemented appropriately, i.e. students are trained in operation of professional-scale industrial machines (not only lab-scale as in most universities). However the peer group got no specific evidence that this laboratory infrastructure is also used for actual research purposes, e.g. modifying machines with innovative mechatronic solutions. The peer group believes that GUC should emphasize further developments in this field and it should better integrate the existing lab infrastructure in research activities. There will be synergy effects and interdisciplinary advantages for both Department of Mechatronics Engineering (MCTR) and Department of Design and Production Engineering (DPE).

Lab work in general is well organized with typically 25 students per lab class working in teams with two to three students on multiple lab benches. This is prerequisite for active learning methodology. However the students have claimed, although many projects are done in accordance with a structured life cycle, too much and repeated effort is spent in these projects for the planning phase, but less time for the time-consuming building and experimental phase. The peer group sees possibilities of enhancing the programme by critically analysing this evidence within the faculty jointly with the students.

## 3 Target and Concept of the Master in Mechatronics Engineering

### 3.1 Qualification Targets

The master “Mechatronics Engineering” covers topics necessary for the five-year Egyptian Engineering education that are not included in the bachelor programme and engross certain areas. After the completion of the master programme, a graduate will be able to demonstrate in-depth expertise in the fields of mechanics, electronics, control theory and/or computer programming in the light of the current research findings, design and conduct research, work efficiently independently and in teams, and act ethically within a defined role. In addition, the graduate is well prepared to join doctoral studies nationally and internationally (especially in Germany).

As well as in the bachelor programme the competencies that the graduates of this master programme acquire are well defined; Graduates

- Have a capacity for analysis and synthesis.

- Develop critical and self-critical abilities.
- Define a scientific question and be involved in research activities.
- Evaluate proposed solutions and contribute to decision making.
- Understand and perform basic laboratory techniques related to specialty component.
- Complete a specified research task and analyse achieved results, discuss and draw conclusions.
- Communicate the research task both in an oral presentation and in writing.
- Demonstrate that they can edit a scientific task independently and using scientific methods.

The objectives of the master programme defined above fully meet international scientific standards.

The students' personal development is assured by focussing more on academic research activities than in the bachelor programme. The peer group appreciates this approach. Like in the bachelor programme the master "Mechatronics Engineering" enables the students to engage in civil society matters.

The employability of graduate students of the master students is well assured. They do not only fulfil the legal requirements for Egyptian engineers, but can also apply to international companies and organisations. A third of the graduates work internationally. The experiences of the alumni network activities are included in the programme development.

### **3.2 Admission Criteria & Demand of the Programme**

Admission to the Master program is currently restricted to GUC graduates and GUC teaching assistants. Admission prerequisite is a minimum grade of "C" and a postgraduate admission committee evaluates the candidates according to their qualifications and credentials. The admission committee will also decide whether the candidate requires pre-master courses. This stands to reason, since the programs are rather short and a significant amount of prerequisites must be fulfilled in order to be able to study them successfully.

### **3.3 Concept**

The master curriculum "Mechatronics Engineering" is directly continuing the bachelor studies, it forms the scientific profile (specialization) of the students and it is split over three semesters with two semesters' course work (9<sup>th</sup>, 10<sup>th</sup>) and one semester master thesis work (11<sup>th</sup>).

The two course semesters split in compulsory and elective modules. In the 9<sup>th</sup> semester a third of the modules are elective modules, in the 10<sup>th</sup> semester two third. Although this seems a reasonable split for specialization the peer group has some serious concerns on the not structured set of elective modules. For the 9<sup>th</sup> semester twelve elective modules are listed and seventeen for the 10<sup>th</sup> semester, respectively. Yet, they cover a very broad scope of topics and unfortunately

not all of them are really established, for some of them are even missing module descriptions. Missing module descriptions have to be submitted (electives). Modules that are still in planning (maybe for future research profiles) should be clearly specified as such.

This indifference in elective raises two problematic issues:

- It raises difficulties for the students to decide appropriate (fitting) module packages for their specialization (confirmed by students),
- It hides clearly visible scientific profiles of GUC mechatronics program.

From discussions with GUC representatives the peer group understood that the faculty of EMS and therefore the study programme, too, are still in the building up phase and in consequence the forming of topical research clusters (dependent on actual faculty competences) is still ongoing. This made it difficult so far to form elective topical clusters. Nevertheless the peer group strongly recommends a topical structuring of elective modules into a limited number of focused scientific master tracks (e.g. three tracks) with clear and sound research profiles and covering existing scientific faculty competencies, e.g. electrohydraulics, robotics. Dedicated student information material concerning these focused research tracks (contents, industrial relevance) should be established and made accessible to students.

Besides this one critic, the curriculum of the Master “Mechatronics Engineering” is in good shape and meets international standards. The requirements on master level are fulfilled.

### **3.4 ECTS & Modularization**

The master programme consists of thirteen modules (six compulsory and six electives plus master thesis module). The majority of the modules including all electives covers five credit points. According to the module description both semester of the first year seem not to cover the appropriate number of 30 credit points; insofar the master programme does not envelop 90 credit points. This may be an accounting mistake or spelling error in the module description. Nevertheless, for students it would be disastrous in formal aspects if the programme only contains 88 credit points. If it runs indeed below threshold the faculty of EMS must immediately adapt the workload of the existing modules to 30 credit points per semester.

### **3.5 Teaching Methods**

Several aspects of the very good teaching methods have been discussed in the bachelor programme above (see III.2.5). For the master programme and its more research oriented focus the peer group deems it best that larger continuing projects should be implemented for scientific research. This would enable the students to gain experience with more sophisticated projects which on the other hand can foster the scientific profile of the faculty of EMS.

## 4 Implementation

### 4.1 Resources

The Faculty of EMS is divided in three departments: Department of Materials Engineering (MATS), Department of Design and Production Engineering (DPE), and Department of Mechatronics Engineering (MCTR). The human resources of 24 professors, assistant professors/ lecturers, and 40 teaching assistants are sufficient for the number of enrolled students (734). Growing numbers of students have been met with additional academic staff members. In MCTR is the ration of teaching staff vs. students 1:11.5.

The organisational framework and qualification conditions for the teaching staff for the study program follow high university standards and are therefore entirely sufficient. The teaching staff is well qualified and also highly engaged in the study programs and it is possible to realize the programs and their defined aims with the current staff. The teaching load of the professors of eight hours per week equals the German standard. Associate professors/lecturers have to teach twelve hours, and teaching assistants (TA) fourteen hours per week. The European expectation that TAs spent about one third of their time with teaching, another third with research and the last third with administrative work is unrealistic with this teaching load. GUC is well aware that this fact contradicts its own goal to foster research activities. Therefore 15% of the TAs are re-dedicated to research assistants without any teaching obligations. This is a step in the right direction.

The academic staff of GUC has an impressive number of national and international publications and successfully engages in several challenging research topics. To intensify these activities, the peer group would appreciate the engagement of international top researchers to assure high level research at GUC. The faculty should promote more PhD- and post-doc-research programmes.

There is a strong linkage between the mechatronics study program, in particular with the electronics and mechanics department. Nevertheless the peer group would appreciate to include courses from other departments, e.g. electrical field theory.

GUC is a private university and by definition does not have comparable funding like public universities with respect to reliability. Nevertheless the financing situation of GUC is relative comfortable. Currently, GUC is able to promote top students by reduced or even no tuition fees. The peer group is convinced that financing is assured for the time of accreditation.

The campus of GUC offers more than sufficient space for teaching as well as research activities. Furthermore, there is plenty of construction ongoing to cope with the increasing number of students. The lab infrastructure is in good shape as well as software components.

The peer group considers the resources fully appropriate for the bachelor and master “Mechatronics Engineering”.

#### **4.2 Organization & Cooperation**

The highest decision level on study programmes is the Board of Trustees (BOT) with the tasks: approving the study plan, starting and ending time of study, semester’s system, and approved credit hours for each certificate, its curricula, holidays, stopping and continuing the teaching activities according to the circumstances. The faculty internal organisation is described above.

Students are encouraged to participate in the development of the educational process through taking part in curriculum committees and taking actions there for the improvement of the quality of teaching of the study programs. A number of academically highly performing students are involved in the curriculum committee meetings with the faculty members to review and improve the curriculum. Moreover the students can evaluate the courses after the semester. Their experience with the feedback given by the teachers is mixed, i.e. some teachers do discuss the results of their evaluations more openly than others.

Since its foundation in 2002 GUC has strong ties to the Universities of Ulm and Stuttgart to which GUC representatives refer as “Patron Universities”. Cooperation agreements have been twice prolonged and adapted. In the actual “Third Phase” (2009-2013) the cooperation agreement focuses on extending research activities. GUC has developed additional alliances within the last years to that extend that GUC has opened in 2011 a branch in Berlin in cooperation with the TU Berlin.

#### **4.3 Examination System**

GUC uses the principle of continuous assessment to examine the student’s performance. The teaching staff uses various methods of examination, including practical and theoretical assignments, quizzes, projects, midterms and finals. The assessments of the total grades are clearly stated in the respective course syllabi. Examination dates and results can be accessed by the students using the university’s Electronic Administration System.

Regarding the final exams, GUC is making major efforts to ensure equal treatment of all students. In compliance with Egyptian law, the university uses a system of anonymized examination materials. Examiners do not have access to the examinee’s names or student IDs before having entered the exam results. Examinees are granted the right to review the graded exams. Students not passing a module immediately are given the chance to resit. During the interview, the Vice Dean for Student Affairs of EMS states that, on average, this applies to approximately 1/3 of the students.

Both the bachelor and master programme include theses as the final assessment. The students apply for topics proposed by the university, a board then assigns the topics to the students. The university uses its collaboration with international institutions of higher education to offer research projects abroad as well. Thesis rules and regulations exist and state necessary data, including the duration. Students writing their thesis abroad are given additional time to accustom to local conditions. When reviewing examinations and final theses, the peer group was convinced that these were sufficient to measure the student's learning outcomes. While tasks and grading did not meet the university's high standards in all cases, they were capable of ensuring that student performance met the desired learning outcomes. Some results exceeded the peer group's expectations.

Regarding students with special needs and long-term medical conditions, GUC states that it "welcomes applications from [such] students". University officials assure that special examination arrangements "can be made in individual cases".

All in all, the university was able to show that it maintains and conducts well-designed processes and structures for final exams, all major regulations are stated and published. Student's special needs are being considered. The assessment throughout the semester is less, but sufficiently formalized.

#### **4.4 Documentation and Transparency**

The peer group had access to all documents concerning the bachelor and master "Mechatronics Engineering" such as diploma supplementa, "Study and Examination Rule for Undergraduate Degrees", "Bachelor Thesis Rules and Regulations", "Selection and Appointment Procedures for Academic Staff" etc. The peer group states that the documentary aspects are fulfilled sufficiently.

The information and counselling services of GUC are very good. The German University in Cairo has a dedicated office called Students Career and Alumni Development Office (SCAD) that does offer individual guidance for the students in all important aspects of their studies such as external/international internships, studies abroad etc. Furthermore, the SCAD office implemented an elaborated online system which offers a multitude of information to the students, such as tracking examination performance, selected courses, timetables and many others.

There are 17 student clubs and organisations listed that enhance the academic and competitive activities of the students as well as social life at GUC. In addition, a Students Union exists since 2011 upon request by the students.

With regard to qualitative aspects of the study programs, the students in general seemed to be very satisfied. They evaluated the work load being feasible; they are also satisfied with the quality of the lectures and the examination system. In case of problems students are supported and

criticism of the students is taken serious. So corrections have been made to the study programs after criticism of the students.

#### **4.5 Gender Equity and Compensation Opportunities for Disabled People**

Students with special needs are provided with additional service and facilities. GUC campus is barrier-free and special examination arrangements are made in individual cases. A disadvantage compensation is not fixed yet in the examination regulations, but in case of illness/special needs individual solutions are found.

No discrimination of a sex was detected at GUC. The gender ratio shows a male:female ratio of the current teaching staff of the faculty EMS is 2.8:1 and 4.5:1 for the department MCTR, respectively.

### **5 Quality Management**

The head of the university puts a strong emphasis on teaching quality and continuous improvement. Officials understand the diversity of the term "quality" and that it includes all aspects of the student life cycle. They state that "GUC is committed to the quality and the standards of the education offered". The guidelines and principles stated in the self-report illustrate this comprehensive approach. The university's organizational structure is determined and the staff is aware of decision-making structures. Decisions are clearly communicated.

GUC has implemented a set of key performance indicators (KPIs) to monitor developments and employs staff dedicated to quality management. KPIs are being assessed and reported. The reviewed programs are relatively new, which is why the university has yet to fully start analysing trends and its causes. The structures and tools to derive needs for action are available.

The students confirm that the University is eager to get feedback from them. Modules are being evaluated by the students. While the process of giving feedback to the students should be improved, the majority of the teaching staff seems to take the evaluation's results serious and deducts possible improvements. The existing process of assessing the students' workload is suitable yet could be refined by in-depth-assessment of selected modules.

Support processes seem to work well, the infrastructure is sufficient and the management is capable of identifying shortcomings and fields of action.

The university tries to maintain contact with all stakeholders. GUC promotes its study programmes among prospective students and does maintain contact with its alumni as well as companies (e.g via its on-site industrial park). The feedback from these groups (high school graduates, GUC graduates, industry) is being used to improve the programme. Standardizing the procedures to analyse this data would reveal more fields of action and allow the University to better understand its customers.



Quality assurance is taking place. Data is gathered and analysed. Quality improvement procedures, however, are not as secured as quality assurance measures. Improvements are taking place and feedback by all status groups (students, teaching and administration staff) is being considered. However, in many cases these improvements seem to have been initiated by individuals. A shift towards continuous improvement initiated by the officials in charge of quality management should therefore be considered. The respective department does not seem to make use of the full potential the implemented tools have to offer, meaning that not all self-imposed aims of the Academic Quality Assurance are fully met. A broader view and stronger implementation of the existing concept of continuous improvement is hence recommended.

In summary, it can be stated that the study programs are being monitored and that the organizational structure allows decision makers to implement necessary measures. The current quality management activities are sufficient to maintain the quality within both the Bachelor and Master program for the time of the accreditation. Nevertheless, GUC does not use the full potential of its quality management system. The further development of the study programs should be fostered and safeguarded by processes of continuous improvement.

## **6 Summary**

GUC and the Faculty of Engineering and Materials Science have established coherent and balanced bachelor and master programmes in “Mechatronics Engineering” that, despite few remarks, are in very good shape and appropriate to international standards. The admission policy of GUC allows attracting the very best high school graduates and suitable candidates for the programme. Both programmes cover almost all necessary topics of mechatronics. Still, some topics should be included or covered more pronouncedly. The modularisation concept is understandable and the teaching methods appropriate to the international level of bachelor programmes and masters, respectively. Both optimally transfer defined goals and anticipated competencies into the practice. The examination system monitors the development of the students’ competencies efficiently. The personal, financial, and infrastructural resources are very suitable for both study programmes. The documentation system and information serviced are well elaborated and not concern to any critics.

#### **IV Decisions of the accreditation commission of ACQUIN**

##### **1 Accreditation Decision**

Based on the report of the peer group, the statement of the German University in Cairo and the statement of the standing expert committee, on 2<sup>nd</sup> December 2013 the accreditation commission took the following decisions:

##### **Bachelor Program „Mechatronics Engineering“ (B.Sc.)**

**The Bachelor program “Mechatronics Engineering” (B.Sc.) at the German University in Cairo is accredited with the following condition:**

- **The students do have to monitor their internship activities by writing an internship report.**

**The accreditation is of limited duration and valid until March 31<sup>st</sup>, 2015. After fulfilment of the condition the study program is accredited until September 30<sup>th</sup>, 2019. The German University in Cairo has to submit the documents for the fulfilment of the condition until September 1<sup>st</sup>, 2014. In case of insufficient proof of fulfilment of the condition the accreditation will not be extended.**

**After receiving a statement of the German University in Cairo, the accreditation procedure can be suspended once for a period of not more than 18 month, if it can be expected that the German University in Cairo will remedy the defects within this period. The statement has to be submitted until January 16<sup>th</sup>, 2014.**

##### **Master Program „Mechatronics Engineering“ (B.Sc.)**

**The Master program “Mechatronics Engineering” (M.Sc.) at the German University in Cairo is accredited with the following condition:**

- **Missing module descriptions have to be submitted (electives).**

**The accreditation is of limited duration and valid until March 31<sup>st</sup>, 2015. After fulfilment of the condition the study programme is accredited until September 30<sup>th</sup>, 2019. The German University in Cairo has to submit the documents for the fulfilment of the condition until September 1<sup>st</sup>, 2014. In case of insufficient proof of fulfilment of the condition the accreditation will not be extended.**

**After receiving a statement of the German University in Cairo, the accreditation procedure can be suspended once for a period of not more than 18 month, if it can be ex-**

**pected that the German University in Cairo will remedy the defects within this period. The statement has to be submitted until January 16<sup>th</sup>, 2014.**

For the further development of both study programs the following recommendations are given:

- There should be a feedback of the evaluation results to the students.
- The infrastructure of the industrial park should be used to enhance the research on machine tools. There will be synergy effects and interdisciplinary advantages for both MCTR and DPE.
- The credit points should be distributed more equally over the course of the semesters.

For the further development of the Bachelor study program “Mechatronics Engineering” the following recommendations are given:

- The module “Writing Research Papers” should be provided in a later semester (e.g. 6th semester).
- The students should give a presentation of the results of their internship report.
- Electrical competences and in particular electromagnetic field, which already exists as module COMM 402, should be included into the curriculum.
- The GUC should establish either a dedicated module on modeling and simulation or running a coordinated action for harmonization and possibly update of the existing relevant modules.

For the further development of the Master study program “Mechatronics Engineering” the following recommendations are given:

- The faculty should provide elective modules according to focused areas (e.g. tracks for electro-hydraulics).
- For scientific research larger projects should be implemented.
- The faculty should promote more PhD- and post-doc-research programs.

The accreditation commission differs in the following point from the accreditation recommendation of the peers:

The accreditation commission rephrases condition 1 of the Bachelor program “Mechatronics Engineering” according to the suggestion of the standing expert committee.

An internship report is mandatory.

## **2 Fulfilment of Conditions**

The German University in Cairo provided documents to prove the fulfilment of the above mentioned conditions. The submitted documents have been thoroughly examined by the ACQUIN standing expert committee. Based on the affirmative statement of the standing expert committee, on 30<sup>th</sup> September 2014 the accreditation commission took the following decisions:

**The condition of the Bachelor program “Mechatronics Engineering” (B.Sc.) is fulfilled.**

**The study program is accredited until September 30<sup>th</sup>, 2019.**

**The condition of the Master program “Mechatronics Engineering” (M.Sc.) is fulfilled.**

**The study program is accredited until September 30<sup>th</sup>, 2019.**