Nile University

School of Communications & Information Technology

Master's in Communications & Information Technology (MCIT)

Vision & Mission

Vision Statement: The vision of Nile University is to be a world-class, internationally recognized research university.

Mission Statement: The mission of Nile University is to contribute to the development of the technology-driven economies in Egypt and the region through the pursuit of education and research at the highest levels of excellence.

To accomplish its mission, NU shall:

- Recruit, develop and retain high quality faculty and staff.
- Attract, support and retain highly qualified and motivated students.
- Create an educational environment and physical facilities conducive to learning and research.
- Establish strong linkages with business, government and NGOs to enhance capacity building in the local and regional communities.
- Promote a culture of creative research and critical thinking.
- Create the conduit through which expatriates can contribute to Egypt and the region.
- Encourage collaboration with other universities and research institutes.
- Embrace intellectual property development and incubate promising ventures.

History

The development of Nile University (NU) dates back to 1999, when a group of community leaders foresaw the need to establish a leading edge non-profit university dedicated to the advancement of higher education and applied research in selected sectors of strategic importance to the economy.

Egypt suffers from a growing shortage of technically capable and well-qualified personnel, who are educated and trained to understand the needs of industry in a dynamically changing global marketplace. Enhancing the nation's technological resources, particularly in high skilled areas, is critical to the country's goal of sustainable economic growth. The engagement of the international R&D community is an important step in this direction. While Egypt has a solid academic sector, it does not presently have a world-class research university capable of meeting industry challenges in high technology sectors. This is the role Nile University intends to play.

Further, the National Telecommunications and Information Technology Strategic Plan calls for building an IT society that would cope with worldwide developments and advancements in technology in order to accelerate economic and social development in Egypt. The main goal of this plan is to bridge the digital divide between Egypt and the developed industrial nations.

The Egyptian Foundation for Technology (EFTED), a non- government organization (NGO), was set up with the primary purpose of establishing Nile University. This university would serve the dual purpose of capacity building in targeted sectors, and of leading applied research in collaboration with the ICT community and other critical industrial sectors in Egypt. To that effect, it is important to link academia, industry, and government. Nile University was conceived with this philosophy in mind. The University obtained approvals for operations from the Higher Council of Private Universities under law No. 101 of 1996. The presidential decree for establishing the University was issued in July 2006, followed by official inauguration ceremony on January 11th, 2007, which marks the final stages in launching NU activities.

NU FACULTY

Faculty at Nile University not only have teaching duties, consulting and community service, but also a wide range of research activities with a prime focus on supervision and training of graduate students. Recognizing the paramount value of its faculty members to the successful delivery of its mission, Nile University aims at attracting Egyptians who are now being educated overseas, or who have become professionals and scientists in foreign countries following their education, in addition to international professors willing to make a commitment to Nile University. Faculty biographies are shown in the Section IX.

CAMPUS

Nile University campus is located at Juhayna Square, Sheikh Zayed City, 20 minutes away from the center of Cairo. It is designed in such a way as to provide the most appropriate scientific environment that supports a "research" university. The 127- acre campus provides complete service facilities for students and faculty, as well as new technology start-ups.

GRADUATE ADMISSIONS POLICY

ADMISSION REQUIREMENTS

All students wishing to take graduate courses at Nile University (NU) must submit an application to the Admissions Office whether or not they are planning to pursue a specific degree. All required materials for admissions, including the applications fee receipt, should be sent directly to the Office of Admissions at NU.

Generally, students admitted to NU are required to hold an appropriate university degree, preferably in a technology or business related discipline. Decisions on admission to the university are made by the admissions committee based on the student's academic records, TOEFL, GRE or GMAT scores, recommendation letters and the student's statement of purpose. General guidelines are a grade of "Good" from recognized universities in Egypt or a GPA of 3.0 from an accredited university or program. A TOEFL score of 61 internet-based (iBT) or equivalent is required from applicants who did not receive their prior degrees from an English speaking institution. The academic committee of Nile University may admit a student with a GPA lower than 3.0 based on the overall evaluation of the student file, work experience, and his/her potential for successfully pursuing postgraduate studies. Other evaluation measures include a personal interview.

Specifically, the application file should include:

- The completed application form including the applicant's personal statement.
- Official degrees and transcripts of all university-level work certified by the granting institution including all degrees (both undergraduate and graduate) previously earned or not completed.
- The official score report of the appropriate entrance examinations.

a. Applicants who did not complete their tertiary studies at an institution where English is the medium of instruction must take the Test of English as a Foreign Language (TOEFL) or equivalent. Test scores are valid for two years only.

b. Applicants to Masters or PhD programs in the School of Communication and Information
Technology, the Graduate School of Management of Technology and the School of
Engineering and Applied Sciences, must submit recent, within five years, Graduate
Record Examination (GRE) scores. Students who have completed a graduate degree in the
same or in a related area in the last three years are not required to take the Graduate Record
Examination, unless it is specifically requested by the department.

c. Applicants for Masters or PhD programs in the School of Business Administration must

submit a recent, within the last five years, official record of the Graduate Management
Admissions Test (GMAT). Students who have completed a graduate degree in a business area in the last three years are not required to take the Graduate Management
Admissions Test, unless it is specifically requested by the department.

- Applicants to the EMBA program must have a minimum of three years of relevant business
experience supported by documentary evidence.
- Two recent passport-size photographs.
- Photocopy of official ID or passport.
- Other requirements as may be specified by the individual program/department.
- Application fee of 100 Egyptian Pounds.
- Three recommendation letters and recent Curriculum Vitae.

The above application requirements are for all Masters and PhD programs.

Admission of a student to Nile University, for any semester, does not imply that such student will be re-enrolled in any succeeding academic semesters. Every applicant for admission can be assured that all credentials will be carefully studied in an effort to select appropriately qualified students. Each application for admission may be examined by faculty members responsible for the graduate program. The Admissions Committee of Nile University may admit a student who doesn't satisfy all requirements, based on the overall evaluation of the student file, special merit, work experience, and his/her potential for successfully pursuing postgraduate studies.

The Admissions Office is responsible of informing each applicant of the results of his/her application. Applicants for admissions to NU should note the following:

- No action is taken until all required documents are included in the application file and the applicant's file is complete.
- Materials submitted in support of an application are not released for other purposes and cannot be returned to the applicant.

CATEGORIES OF ADMISSION

Students are admitted to NU under any one of the following categories:

Full Admission: Granted to students who have met all admission requirements.

Provisional Admission: Granted for one semester only, to students who have not fully satisfied one or more of the application requirements.

Non-Degree Admission: This category provides an opportunity for graduate study for qualified professionals who do not wish to work toward an advanced degree, but who for

professional reasons need to continue to take graduate courses. Students who are applying under the non-degree status must submit all admission requirements outlined earlier, except for the GRE and the GMAT scores which they are exempted from. No more than twelve (12) credit hours may be taken while in this status.

A non-degree student may apply for a change of status to a degree student after satisfying the GRE or GMAT admission requirement. The department/program of major will consider accepting credit for courses taken under the non-degree status at NU but not to exceed 6 credit hours for the M.S degree and 8 credit hours for the EMBA.

Auditors: Applicants who would like to attend certain classes without earning any credit may apply as auditors. This category of admission is dependent on space availability. Students are not eligible to sit for examinations, submit papers and assignments, earn academic credit and grade, or receive any enrollment certification from Nile University.

RE-ADMISSION

Re-admission may be granted to students in good academic standing who have not been continuously enrolled in regular sessions. Students must contact the appropriate departmental office three months in advance of registration. If additional college work has been completed elsewhere since the last enrollment at Nile University, an official transcript will be required. Please refer to additional policies and procedures of the specific program for additional information about readmission.

RECENCY OF CREDIT

All graduate work to be transferred for credit from other institutions must be completed within four years of the time of admission to Nile University. Only graduate courses with a grade of B or equivalent can be transferred to NU.

REGISTRATION

Upon admission to Nile University, students must register for the courses that pertain to their program of study. However, their enrolment at NU would only be completed after payment of their tuition for the first semester.

FULL-TIME STUDY

Full-time students are graduate students taking nine or more graduate credits in a regular semester.

ACADEMIC REGULATIONS FOR GRADUATE STUDENTS

CREDIT HOURS

Coursework, grading and graduation requirements are all functions of the credit hour. In general, a credit hour represents a one-hour class period and three hours of individual study each week for one semester.

CLASS ATTENDANCE

Class sessions and group meetings are considered not only academic but also professional activities. As such, students are expected to attend group meetings and classes, regularly and punctually. The logic of this process is to ensure the active and continued engagement in discussions, and a rich learning experience.

If a class must be missed, for whatever reason, the student should notify the instructor and the program director, giving as much advance notice as possible. In all cases, it will be the student's responsibility to make up for work missed. Under no circumstances will job interviews, fieldwork for any course, or personal circumstances that are not absolutely exceptional, be accepted as sufficient grounds for absence. Absences, even when justified, may be taken into account in the grading process at the discretion of the instructors, who will keep the program director informed of absences and late arrivals.

If class attendance in any course is less than 80% and with the approval of the instructor, the student will automatically get a maximum grade of C on that course. Exceptions may be given with permission from the professor teaching that course and approval of the program director upon a prior notification.

Failure to comply with these policies is considered serious misconduct leading to potential dismissal or other action, as deemed appropriate by the instructor and the program director.

STUDENT EVALUATION IN COURSES

Student evaluation in courses will be based on the following criteria:

- Exams and assignments
- Classroom performance
- Attendance / Participation
- Cases
- Projects / Presentations
- Other criteria that the instructor deems important for the course

EXAMINATIONS

Examinations are an integral part of any program and are conducted according to the following standards:

- Students must pass examinations required for the successful completion of a course.
- Students may not communicate or collaborate with each other in any way during closed book written examinations and when working on assignments, unless these are explicitly stated as group assignments.
- Books or notes may be used when taking an open-book examination with the specific authorization of the instructor, and then only, within the limits set by the instructor.

GRADING

Nile University uses the credit hour system for its curriculum and has adopted the following grading system for its graduate studies:

Letter Grade	Grade Point Value	Description
A+	4.0	Excellent
A	4.0	Excellent
A-	3.7	Excellent
B+	3.3	Very Good
B	3.0	Good
B-	2.7	Conditionally Pass
C+	2.3	Conditionally Pass
C	2.0	Conditionally Pass
F	0.0	Fail

Grades that will show on the student's transcript but are not included in calculating the GPA are:

I	Incomplete	**The student has not completed the course requirements and was allowed a grace period to complete it beyond the end of the semester.**
S	Satisfactory	**The student is working satisfactorily towards the completion of his/her thesis/dissertation.**
US	Unsatisfactory	**The student is not working satisfactorily towards the completion of his/her thesis/dissertation.**
W	Withdrew	**Student withdraws early enough before the instructor can evaluate his/her performance.**
WP	Withdrew Pass	**Based on the instructor's evaluation, the student's work was satisfactory up till the time of withdrawal.**
WF	Withdrew Fail	**Based on the instructor's evaluation, the student's work was unsatisfactory up till the time of withdrawal.**
P	Pass	**This grade is granted for a Pass/Fail course or a thesis.**
AU	Auditor	**This grade is granted for auditors as a proof for course attendance.**

Assignment of grades is the responsibility of the instructor. Based on the above grading system, a grade point average is calculated for each student.

- The Quality Points per course is calculated by multiplying the Grade Point Value obtained in the course by the course's credit hours.
- The Grade Point Average during a specific period is determined by dividing the summation of Quality Points earned during this period by the number of credit hours completed in the same period.
- Cumulative GPA is the summation of Quality Points of all courses divided by the total number of course credit hours completed.

Thesis/ Major Paper

The student receives a grade of "P" when his/her thesis/ Major Paper is completed and successfully defended. Until then, the student semester evaluation on his/her progress towards completing a thesis/ Major Paper is granted a grade of "S" or "U".

ACADEMIC EVALUATION PROCESS

The program director is responsible for ensuring the consistent application of the program's standards and criteria. He/she will evaluate the individual cases of students who do not meet the minimum academic requirements.

In cases of unsatisfactory academic performance, a GPA lower than 3.0, the program director may ask the student in question to take a general examination at the end of the first year to test his or her proficiency in the subjects covered during the year. The examination date is given at the end of the academic year. Continuation in the program will depend on the student's performance in this test.

RESIDENCY REQUIREMENT

Students pursuing an EMBA degree must spend at least three semesters in full time study at NU. Students pursuing other degree programs must spend at least two semesters in full time study at NU.

THESIS PROCEDURE

Students opting for writing a thesis must have a thesis committee to advise them on the thesis research. The department/program concerned nominates a thesis committee, in consultation with the student, to the dean of graduate studies/provost who approves and appoints the student thesis committee. The chairman and at least one member of the committee must be regular members of NU faculty and should be from the program or department of concentration. The third member may be from outside the program or department, but should be experienced in the thesis area.

The chair of the thesis committee will serve as thesis advisor to closely supervisor the student’s progress towards completing the thesis. However, the chair may delegate this task to another member of the thesis committee whose research agenda is more in line with the thesis area. The student and the advisor should report to the committee regularly on the candidate’s progress towards completing the thesis.

The duties of the thesis committee are:

- To review and approve the student’s thesis proposal.
- To consult with and advise students on their research.
- To meet, at intervals, to review progress and expected results.
- To read and comment upon the draft thesis.
- To meet, when the thesis is completed, to conduct the final oral examination of the document and to satisfy itself that the thesis is an adequate contribution to knowledge, and that it is written in lucid and correct English and submitted in approved form.

The candidate should have a final acceptable typescript of the thesis in the hands of each member of his/her committee at a reasonable time in advance of the final thesis

defense.

A final public oral defense of the thesis is required. However, none but the members of the thesis committee may interrogate the candidate. The thesis defense must be held, at least, one month prior to commencement. Upon passing the final exam, students must apply for graduation at the Registrar's Office and pay graduation fees.

Upon passing the thesis defense, five copies of the thesis in approved form on proper paper, one copy on a CD and nine copies of an abstract of not over 200 words will be handed in to the Office of Graduate Studies on or before the date specified in the calendar published each year, accompanied by a certificate of approval of the thesis defense signed by the thesis committee.

MASTERS GRADUATION REQUIREMENTS

To be eligible for graduation, students must complete a minimum of 75% of the credit hours required for graduation at NU and accumulate a GPA of 3.0 or higher in a five year period. At the end of the first academic year, a committee composed of the program director and selected staff evaluates each individual's GPA, and will discuss with the student any concerns regarding his/her performance and the course of action required by the student for successful completion of the program. This process will be documented and included in the participant's academic file. Typically, a student whose GPA falls below 3.00 is put on probation and is given one semester to correct this discrepancy. If the student's GPA continues to be lower than 3.00 at the end of the probationary period, s/he will be subject to dismissal from the program. However, the student may submit a petition explaining the special circumstances that resulted in his/her low GPA. The student affairs committee reviews the case and may allow the student to register for one last semester, during which s/he must eliminate the GPA discrepancy; otherwise s/he gets dismissed from Nile University.

Upon completing the masters' requirements, students must apply for graduation at the Registrar's Office and pay graduation fees.

TRANSFER OF CREDIT

With the approval of the program director and the respective dean, up to 9 credit hours may be transferred from another accredited institution towards the degree requirements for management of technology, engineering and communication & information technology programs while up to 12 credit hours may be transferred from another accredited institution towards the degree requirements for the EMBA. A grade of "B" or better must be earned in courses considered for transfer. In general, students cannot transfer more than 25% of the credit hours required for graduation in any graduate program. Credits that have been counted towards another degree cannot be transferred.

INCOMPLETE POLICY

Students who prove they have strong reasons for not completing a certain course

maybe allowed to petition for an incomplete grade using appropriate forms which must be approved by the course instructor and program director. In this case, students are granted a grade of "I".

Students must arrange with the instructor and the program director to complete the pending work before the end of the following semester. In case the student fails to complete the required work, s/he will be automatically granted the grade assigned for the work already submitted.

The "Incomplete Form" is available at the registrar's office, and should incorporate the following information:

- Reason for requesting to incomplete the course.
- Pending materials and assignments required for course completion.
- Tentative grade on the work already submitted.
- Deadline for submission of incomplete work, which must not be later than the end of the following semester.

VOLUNTARY WITHDRAWAL FROM COURSES

Students who wish to voluntarily withdraw from courses during the semester must get approvals from their instructors and program directors. If a student applies for withdrawal from a course(s) before the deadline for withdrawal without academic penalty, which is 15% of the course's contact hours, s/he gets a grade of "W" in that course(s). If the student applies for withdrawal from a course(s) after the above-mentioned deadline, s/he gets grades of "WP" or "WF" in each course s/he withdrew from, depending on his/her performance in that course.

COURSE RETAKE POLICY

Except in cases of academic dishonesty, this policy allows a student who has received a grade less than "C" in a course to retake the same course or a substitute course. In this case, only the grade received when retaking the course will be counted towards the student's GPA. The grade received during the first time the student took the course will show on his/her transcript, but will not count towards the student's GPA. Under this policy, EMBA students could repeat up to a maximum of 8 credit hours of course work, while students in other programs are allowed to repeat up to a maximum of 6 credit hours of course work. According to this policy, the student is allowed to retake the same course or a substitute course upon the approval of the program director.

VOLUNTARY WITHDRAWAL FROM THE PROGRAM

Students who wish to voluntarily withdraw from the program during the semester must get approvals from their instructors and program directors.

If the student applies for withdrawal before the deadline for withdrawal without academic penalty, s/he gets a grade of "W" in all courses during this semester. If the student applies for withdrawal after the above mentioned deadline, s/he gets grades of "WP" or "WF" depending on his/her performance in each course.

Students who have withdrawn from a program and wish to apply for re-admission

must do so in writing to the program director, one month in advance of the semester they intend to resume their studies in. The application must explain their activities since leaving the program, and the reasons for wanting to rejoin it. The director will then decide whether or not re-admission is granted, based on the information submitted and the students' performance in the program before withdrawal.

RE-ADMISSION OF STUDENTS WITH ACADEMIC DIFFICULTIES

Students who were dismissed from the program because of academic difficulties may apply for re-admission if they had completed all the first-year courses with a GPA of 2.50 or higher. Students cannot be readmitted before two years have elapsed since their dismissal, nor after four years since that date. In exceptional circumstances, the minimum period may be reduced to one year.

Students who were dismissed from the program because of academic difficulties in the second year may apply to be readmitted in the term following the one in which the difficulties arose.

The application for re-admission to the program must include a description of the professional activities performed since the withdrawal. Students must also make a compelling argument why they should be readmitted to the program. In any case, the student must take a re-admission examination, and the program director and selected faculty members will then decide on the re-admission applications.

ACADEMIC INTEGRITY POLICY

Nile University, its faculty, staff and students value and adhere to the concepts of academic integrity and the highest level of academic and professional conduct. In their quest for knowledge, the university community must uphold high levels of integrity and ethical conduct in all its pursuits including teaching, learning, research and service.

Dishonesty in the pursuit of knowledge is not acceptable and includes, but is not limited to:

- Dishonest submission of documents for grade, examples: Plagiarizing reports/cases; cheating on exams or assignments; multiple submissions of the same work for grades; fabrication of data or documents.
- Obtaining or attempting to obtain an unfair advantage, examples: Gaining access to exams; stealing or destroying library or research materials; unauthorized collaboration on assignments; unauthorized retention or circulation of previous exams; interfering with other students' work.
- Unauthorized access to records, examples: Viewing or interfering with confidential computer records or programs or systems, releasing unauthorized information gathered.
- Aiding and abetting: Providing material, information, or other assistance, which violates standards for academic integrity.
- Threatening, effecting or encouraging bodily, professional, or financial harm to faculty, staff, administrator or student.

The university reserves the right to take disciplinary action against the violating party(s) according to the principles/procedures shown below. An instructor has full authority to deal with an academic dishonesty incident within the context of his/her course. Disciplinary action, in this case, may cover the range from reprimand to "F" for the course grade. The instructor may also recommend suspension or dismissal from the university.

The instructor's action on incidents of academic dishonesty must be communicated to the student(s) involved; and to: the Dean/Program Director and the Vice Provost for Student Affairs within two weeks of the time the instructor became aware of the incident. All students involved in academic dishonesty will receive an official letter of warning from the Vice Provost for Student Affairs, a copy of which will remain in the students' file in the department as well as in the Student Affairs Office and/or the office responsible for monitoring academic integrity.

When a case of academic dishonesty is reported with a recommendation for suspension or dismissal from the Instructor, the vice provost for student affairs will form an ad-hoc Academic Integrity Committee to investigate the case. The Committee will meet promptly to investigate the case and submit a recommendation to the vice provost. The vice provost will send his/her recommendation, together with the committee's, to the provost, who makes the final decision on the case.

Once the Academic Integrity Committee has given a hearing to the student and submitted its recommendations, no further appeal may be made unless substantial new evidence is presented to the vice provost for student affairs, who will evaluate the evidence and reopen the case, if deemed necessary.

TRANSCRIPTS

Graduating or withdrawing students in good standing are granted one free transcript of their academic record at NU.

GRADUATE STUDIES in

C I T

تقدم كلية الإتصالات وتكنولجيا المعلومات البرامج التالية لدرجة الماجستير فى تخصصات الإتصالات وتكنولوجيا المعلومات:

1. برنامج الماجستير فى المعلوماتية (Informatics)
2. برنامج الماجستير تكنولوجيات الإتصالات اللاسلكية (Wireless Technologies)
3. برنامج الماجستير فى هندسة البرمجيات (Software Engineering)
4. برنامج الماجستير فى أمن المعلومات (Information Security)

Informatics Programs

i. Master of Science in Communication and Information Technology (MSCIT)

ii. Master of Communication and Information Technology (MCIT)

Wireless Technologies Programs

i. Master of Science in Communication and Information Technology- Wireless Technologies (MSCIT-WT)

ii. Master of Communication and Information Technology- Wireless Technologies (MCIT-WT)

Software Engineering Programs

i. Master of Science in Communication and Information Technology- Software Engineering (MSCIT- SWE)

ii. Master of Communication and Information Technology- Software Engineering (MCIT-SWE)

Information Security Programs

i. Master of Science in Communication and Information Technology- Information Security (MSCIT-IS)

ii. Master of Communication and Information Technology- Information Security (MCIT-IS)

INFORMATICS PROGRAM

i. Master of Science in Communication and Information Technology (MSCIT)
ii. Master of Communication and Information Technology (MCIT)

PROGRAM DESCRIPTION

The Master's in CIT-Informatics Program is a high-quality M.Sc. program aimed at imparting advanced knowledge across a broad range of informatics science topics and offers training in higher skills around a variety of specializations. It enables the opportunity to go deeper into the fundamental principles of computing while focusing on the applications. The program offers a wide choice of courses in an innovative approach for teaching M.Sc. based on the research strength of Nile University's Center for Informatics Science (CIS). This facilitates the provision of combination of breadth, depth and flexibility that is difficult to find elsewhere since students undertake a collection of specialized course units and research thesis enabling them to graduate from our highly respected program with a specialism that reflects their interests and career aspirations. The program faculty consists of highly experienced professors and researchers from NU and international partner universities and institutions.

LOCAL/ INTERNATIONAL PARTNERS

The Informatics program has strong collaborations with local and international partners in the form of active research projects, student exchange, and joint supervision. Local partners include, but not limited to, the National Cancer Institute, the Agricultural Research Center, Kasr El Eini Hospitals, the Eye Hospital, the Traffic Department, as well as several companies in the areas of communication and information technology. International partners include a group of world-renowned institutions and professors from top universities in USA, Canada and Europe such as Imperial College London, Johns Hopkins University, University of Ulm, and the Swedish Royal Institute of Technology KTH.

WHO SHOULD ATTEND

The program is targeting fresh graduates and professionals who seek to develop their knowledge in advanced computing disciplines. Generally, students admitted to NU are required to hold an appropriate university degree preferably in engineering, computer science or other related discipline. Decisions on admission to the university are made by the admissions committee based on the student's academic records, TOEFL and GRE

scores, recommendation letters and the student's statement of purpose. Other evaluation measures include a personal interview. Full information on admission requirements can be found at *http://www.nileu.edu.eg/GraduateAdmissions.html*

PROGRAM OUTCOMES

Graduates of the CIT-Informatics Program will have a strong understanding of the key underlying informatics principles related to each specialization, possess the applied knowledge required for excellent job prospective in high-growth CIT sectors, and acquire solid background to pursue a successful R&D career in academia or industry. Most previous graduate from the program joined multinational companies or top universities to study for PhD.

WIRELESS TECHNOLOGIES PROGRAM

i. Master of Science in Communication and Information Technology- Wireless Technologies (MSCIT-WT)

ii. Master of Communication and Information Technology- Wireless Technologies (MCIT-WT)

PROGRAM DESCRIPTION

Wireless technologies hold the promise for providing ubiquitous information access. The popularity of wireless devices is evident in the exponential growth of wireless LANs and cellular networks all over the world. In order to provide world-class training for our M.Sc. students, we adapt an integrated approach for research and education. Therefore, our curriculum strikes a balance between introducing the basic tools required to establish a world-class research program and exposing the students to recent technological advances in the field. The research and the requirements are intended to promote creativity and critical thinking in our student body. The Masters program will benefit from an intimate relationship with our new Wireless Intelligent Networks Research Center (WINC). This will allow our students access to state of the art lab facilities based on the recently introduced Wireless open Access Research Platform (WARP) and the emerging Wireless Sensor Networks (WSN) technology. Finally, the students will have the opportunity to interact with leading researchers in the field.

WHO SHOULD ATTEND

- Fresh graduates with demonstrated potential to conduct cutting edge research in the area or the desire to broaden their knowledge in wireless technologies.
- The technical staff of the mobile operators.
- The technical staff of international wireless equipment manufacturers.
- R&D engineers at emerging wireless start-ups.

PROGRAM OUTCOMES

Graduates will have the vision and the knowledge to provide innovation and technical leadership in the wireless industry. They will also be capable of leading the region in this area of competing at the international level. In addition, graduates will have the skills to become world-class researchers who can make fundamental contributions to the wireless networking area.

SOFTWARE ENGINEERING PROGRAM

i. Master of Science in Communication and Information Technology- Software Engineering (MSCIT-SWE)

ii. Master of Communication and Information Technology- Software Engineering (MCIT-SWE)

PROGRAM DESCRIPTION

Over the last few years, Egypt witnessed a significant growth in its communication and information technology industry in general and software development in particular. Different studies and indicators place Egypt among the countries with the highest potential growth in these sectors, and foresee that the software industry could become one of the main contributors in Egypt's economy in the decades to come. One of the challenges however, is the number of qualified technical professionals that would lead this effort and build the base for this promising industry. There is a shortage of well-formed software architects, designers, team leaders, and project managers with the skills needed to really produce the scale and quality of software products that would place Egypt on the world's map in software development. It was therefore a strong motive for Nile University with its vision of "growing leaders of the technology driven high-growth economy" to offer a graduate program specialized in fulfilling this need and help raise the standards of the Egyptian software industry to become competitive in the global market. The program aims at producing technically astute graduates with solid managerial, leadership, and communications skills, prepared for future roles as leaders in the software industry.

Who should attend/Target Market

The program is targeting software professionals who seek to develop their knowledge of the software engineering discipline. Prospective students are typically from computer science, or computer engineering backgrounds. An experience and background in the software development industry is highly recommended. The target market is software development companies or any organization developing its own information system.

Program Outcomes

Graduates of the program will:

a. Have a solid understanding of the software development life cycle and the concepts of operation of software projects.
b. Possess the knowledge and practice of managing software development.
c. Be able to utilize the methodologies of hardware, software integration, and networking.
d. Master the principles of requirements management, analysis modelling, software architecture design, testing and verification, and quality assurance.

INFORMATION SECURITY PROGRAM

i. Master of Science in Communication and Information Technology- Information Security (MSCIT-IS)

ii. Master of Communication and Information Technology- Information Security (MCIT-IS)

Program Description

Security domain is a key component in any field. It plays a vital role in securing industry know how, health records, online banking transactions, research results and many more. In 2006, NU dedicated a department in its ICT School for security research and education. This project was aimed to be the national project for leading and promoting ICT security sector in Egypt and the whole region.

Security and privacy have evolved dramatically in the last 10 years. In our department we focus on the most vital security topics, such as cloud computing and big data security, keeping in mind the basics of security knowledge a student needs to have. These basics include but not limited to cryptography, operating systems and mobile applications security, security in wireless ad-hoc networks, digital forensics, penetration testing, malware analysis, security incident handling, risk management, and systems exploitation.

Local/ International Partners

International partners include a group of world-renowned institutions from well-recognized universities in USA, Canada and Europe.

Who Should Attend

The program is targeting IT professionals, system managers, and network administrators, who seek to develop their knowledge of the information security. An experience and background in the IT/system/network administration is highly recommended.

Sectors benefiting from the program include government organizations, public, and private companies, banks and financial institutions, and any organization using information technology.

Program Outcomes

Graduates of the program will be able to:

- Handle the planning, acquisition, and development, of a secure information infrastructure in an organization
- Assess the vulnerability, risks, and threats of an organization's information systems
- Respond to security emergencies and incidents
- Assess the impact of the legal environment, and information security policies on organizational objectives.

Educational Structure

الهيكل التعليمى للبرامج التعليمية لماجستير الإتصالات وتكنولوجيا المعلومات

Principles & Criteria

This section outlines the main principles and criteria, on the basis of which, the curricula of the CIT programs are structured.

1. Some courses are identified as Core. It is highly advisable that the core-course principle is not only adopted but is also broadened.
2. Any other diverse areas of informatics may be added if deemed vital and necessary, which would then have to be educationally sustainable, scalable, and well justified.
3. At the time when the activities of the research centers are understandably diverse and time variant an educational program curriculum should be robust and sustainable for a number of years, after which it is subjected to revision.
4. Duplication of courses is forcefully avoided. Duplication is defined in terms of the course contents as well as the course title.
5. Core courses should serve as many programs/tracks as possible. In other words, those courses, which are meant to serve more than one program/track, should be designed such as to successfully serve students of all interested tracks, who may also happen to have diverse educational backgrounds.
6. The course termed "Selected Topics" is recognized in principle. Its offering, however, is restrained and kept to a minimum. The most acceptable scenario for offering a selected-topics course is when such a topic is targeted to constitute a separate course in the near future. Alternatively, topics that are deemed important enough may be added to the contents of an existing course in the form of one or more chapters.
7. The courses and contents of a program should not be expected to always serve all the research needs of Master's and Ph.D. students. The knowledge needed for their research work may (and should) be supplemented by reading published articles, reports and books as advised by their research supervisors.

يتكون الهيكل التعليمي للبرامج الأربعة من ثلاث طبقات:

- المقررات المشتركة بين جميع البرامج وتمثل 6 ساعات معتمدة فى ثلاث برامج و 3 فقط فى حالة برنامج تكنولوجيات الإتصالات اللاسلكية و برنامج أمن المعلومات.
- مقررات التخصص وتمثل 6 ساعات معتمدة.
- المقررات الإختيارية وهى تشكل مجمع كامل لجميع المقررات من حق الطالب أن يختار منها مايقابل 12 ساعة معتمدة (15 ساعة معتمدة فى حالة برنامج تكنولوجيات الإتصالات اللاسلكية و برنامج أمن المعلومات).
- مقرر فى مجال إدارة الأعمال وإدارة التكنولوجيا بما قيمته 3 ساعات معتمدة.
- تشكل رسالة الماجستير 9 ساعات معتمدة.
- وبهذا يصبح مجموع الساعات المعتمدة المطلوبة للحصول على الدرجة 36 .

Curriculum for CIT Programs

This curriculum is designed collectively for the four Communication and Information Technology (CIT) programs.

Program Structure

Component	M. Sc.	M.
CIT Common Core Courses*	6 Credits	6 Credits
Track Core Courses	6 Credits	6 Credits
Elective (pooled) Courses*	12 Credits	18 Credits
MOT/ Business Courses	3 Credits	3 Credits
Thesis / Project	9 Credits	3 Credits
	36 Credits	**36 Credits**

**Students in Wireless Technologies and Information Security programs are proposed to take 3 credits as common core and 15 credits as M.Sc. elective courses (21 credits in case of Master of Wireless Technologies and Master of Information Security).*

I. CIT Common Core Courses

Course Title	Code (if any)
Systems Engineering	CIT-601
Fundamentals of Networking	CIT-606
Network Architecture	CIT-609
Formal Methods and Computer Algorithms	CIT-645

* Students in Informatics and Software Engineering programs choose two courses. Students in Wireless Technologies and Information Security programs choose one course.

II. Programs' Track Core Courses

"Track Core Courses" serve to identify the track (or, specialty), which is to be marked in the awarded Master's degree upon graduation

Master's in CIT – Informatics *

Course Title	Code (If any)
Image Processing and Computer Graphics	CIT-643
Scientific Computing	CIT-644
Statistical Analysis and Machine Learning	CIT-651

* Students choose two out of three courses

Master's in CIT – Wireless Technology (WT)

Course Title	Code (If any)
Stochastic Processes	CIT-604
Information Theory	CIT-605

Master's in CIT – Software Engineering (SWE)

Course Title	Code (If any)
Advanced Software Engineering	CIT-617
Software project Management	CIT-612

Master's in CIT – Information Security (IS)*

Course Title	Code (If any)
Introduction to Information Security & Cryptography	CIT-620
Crypto-protocols & Network Security	CIT-621
Operating Systems & Applications Security	CIT-622

* Students have to attend CIT-620 and choose one out of CIT-621 and CIT-622

III. CIT Pool of Courses

Code (If any)	Course Title	Status	Pre-Requisite
CIT-601	Systems Engineering	Common core course	
CIT-602	Software Engineering	Pool	
CIT-603	Computer Architecture		
CIT-604	Stochastic Processes	Track Core course for WT program	
CIT-605	Information Theory	Track Core course for WT program	CIT-604
CIT-606	Fundamental of Networking	Common core course	
CIT-607	Operations Research	Pool	
CIT-608	Introduction to Convex Optimization Theory	Pool	
CIT-609	Network Architecture	Pool	
CIT-610	Cloud Computing	Pool	
CIT-611	Software Architecture	Pool	
CIT-612	Software Project Management	Track Core course for	

		SWE program	
CIT-613	Software Testing & Verification	Pool	
CIT-614	Network Programming & Distributed Object Systems	Pool	CIT-606
CIT-615	Software Development Studio I	Pool	
CIT-616	Software Development Studio II	Pool	CIT-615
CIT-617	Advanced Software Engineering	Track Core course for SWE program	
CIT-620	Introduction to Information Security & Cryptography	Track Core course for IS program	
CIT-621	Crypto-protocols & Network Security	Track Core course for IS program	CIT-620
CIT-622	Operating Systems Security	Track Core course for IS program	CIT-620
CIT-623	Security in Wireless Ad Hoc Networks	Pool	CIT-620
CIT-624	Security Evaluation Methodologies		
CIT-625	Security Incident Handling	Pool	
CIT-626	Information Security Ethics, Policy and Legal Issues	Pool	
CIT-627	Risk Management	Pool	
CIT-628	Information Security Governance	Pool	CIT-627
CIT-630	Design of Communication Systems	Pool	CIT-604, CIT-605
CIT-631	Antennas	Pool	
CIT-633	Wireless Communications	Pool	CIT-630
CIT-634	Advanced Coding & Signal processing	Pool	CIT-604, CIT-605
CIT-635	Design and Implementation of Wireless Networks	Pool	CIT-633
CIT-636	Digital IC Design	Pool	
CIT-637	Detection and Estimation	Pool	
CIT-638	Advanced Networks	Pool	CIT-606
CIT-640	Convex Optimization		
CIT-641	Discrete Stochastic		
CIT-643	Image processing and 3D Computer Graphics	Track core course for Informatics program	
CIT-644	Scientific Computing	Track core course for Informatics program	
CIT-645	Formal Methods and Computer Algorithms	Common core course	
CIT-646	Machine Learning and Data mining	Track core course for Informatics program	
CIT-647	Mathematical Methods in Visual		

	Computing		
CIT-650	Introduction to Big Data	Pool	
CIT-651	Statistical Analysis and Machine Learning	Track core course for Informatics program	
CIT-652	Advanced Big Data Analytics	Pool	CIT-650
CIT-653	Data Mining of Massive Datasets	Pool	CIT-651
CIT-660	Digital Forensics	Pool	CIT-620
CIT-661	Malware Analysis	Pool	CIT-620
CIT-662	Systems Exploitation	Pool	CIT-620
CIT-663	Mobile Applications Security	Pool	CIT-620
CIT-690	Selected Topics in CIT		
CIT-699	Independent Studies in CIT		
CIT-700	Thesis		
CIT-710	Project		

Sustainability:

It is of great importance to plan the Master's program sustainability. The sustainability is classified as academic, institutional and financial sustainability, which are addressed as follows:

Academic Sustainability:

1. Update the academic content and correlate with current upgrades within the program content and trends within the different institutions offering the program.
2. Update the practical facilities at NU to match the industry requirements.
3. Recruit most suitable candidates for teaching and tutoring of the enrolled Masters students.

Institutional Sustainability:

1. Assure compliance with the Supreme Council requirements and seek accreditation and program renewals on time.
2. Finalize agreement with industry to partner with NU for practical training and potential source of thesis topics.

Financial Sustainability:

1. Students applying from the industry for a Master's degree from NU only contribute to the program via tuition fees.
2. Contribution from Nile University by financing Research Assistants.

أعضاء هيئة التدريس

الجدول التالى يعطى قائمة بأعضاء هيئة التدريس فى برامج ماجستير الإتصالات وتكنولوجيا المعلومات. جدير بالذكر أن عددا آخر من أعضاء هيئة التدريس من خارج الجامعة –إضافة الى القائمة الموضحة- يقومون بتدريس بعض المقررات.

مسلسل	الإسم	الدرجة الأكاديمية	الوضع الأكاديمى		SWE	INF	WT	IS
1	حسين أنيس	أستاذ	معين					
2	هشام الجمل	أستاذ		بعض الوقت			√	
3	محمود علام	أستاذ	معين		√			
4	محمد نافع	أستاذ		بعض الوقت			√	
5	سمحاء البلتاجى	أستاذ	معين			√		
6	نشوى عبد الباقي	أستاذ مساعد	معين					√
7	عمرو القيعي	أستاذ مساعد		بعض الوقت			√	
8	أحمد سمير	أستاذ مساعد		بعض الوقت		√		
9	محمد الحلو	أستاذ مساعد	معين			√		
10	تامر البط	أستاذ مساعد		بعض الوقت			√	
11	عمرو الشريف	أستاذ مساعد	معين				√	
12	ماريان عازر	أستاذ مساعد		بعض الوقت				√
13	أحمد شوشة	مدرس	معين					√
14	سيف الدولتلي	مدرس		بعض الوقت		√		

أعداد الطلبة المقيدين بماجستير الإتصالات وتكنولوجيا المعلومات

الجدول التالى يوضح أعداد الطلاب المقيدين بالدرجة بتخصصاتها الأربعة وذلك على مدى الثلاثة فصول الدراسية السابقة.

Program	Spring'15	Fall'15	Spring'16
INF	31	38	33
INS	31	36	39
SWE	21	23	17
WT	17	19	16

أعداد الرسائل التى تمت إجازتها فى الفصول الثلاث الماضية

Program	Spring'15	Fall'15	Spring'16
INF	4	4	2
INS	3	1	0
SWE	0	0	0
WT	4	0	3

Courses Descriptions

CIT-601 Introduction to Systems Engineering, 3 cr hr

Introduction to system engineering outlining traditional design process. The content of the course follows typical system design life cycle. It correlates the different disciplines required to deploy and sustain a system for missions in information technology, information processing and electronics domains. Topics include system architecture into hardware and software components, requirement allocation, performance budgeting and integration and testing.

CIT-602 Software Engineering, 3 cr hr

This course focuses on critical aspects of the software development life cycle that have significant influence on the overall quality of the software system including techniques and approaches to software design, quantitative measurement and assessment of the system during implementation, testing, and maintenance, and the role of verification and validation in assuring software quality.

CIT-603 Computer Architecture, 3 cr hr

The course includes an overview of history and current and future trends and issues in processor design, as well as performance measurement and enhancement techniques. Topics covered include pipelining, parallelism, multiprocessors, cache & memory issues, and interconnections networks.

CIT-604 Stochastic Processes, 3 cr hrs

This course introduces random processes and their applications from a discrete-time point of view, and discusses the continuous-time case when necessary. The course covers the basic concepts of random variables, random vectors, stochastic processes, and random fields. It moves on to common random processes including the white noise, Gaussian processes, Markov processes, Poisson processes, and Markov random fields. Advanced topics are also covered including estimation theory and optimal filtering including linear prediction, Wiener and Kalman filtering, linear models and spectrum estimation.

CIT-605 Information Theory, 3 cr hrs

Prerequisite: CIT 604. This course covers mathematical models for channels and sources. The basic concepts of entropy, relative entropy, and mutual information are defined, and their connections to channel capacity, coding, and data compression are presented. Limits for error-free communication, information theory also presents limits for data compression, information, data compression, Topics also include channel capacity, Shannon's theorems and rate distortion theory.

CIT-606 Fundamentals of Networking, 3 cr hrs

This course covers fundamental concepts in the design and implementation of computer networks. Examples are drawn primarily from the Internet protocol suite. In the first part of the course, we will cover layered networking models, application layer protocols, transport layer protocols, the Internet Protocol (IP), and intenetworking. In addition, advanced topics such as wireless networks and network security will be introduced. In the second part of the course, the course focuses on queuing theory and modeling networks using queues. Topics covered include Birth-death processes, Poisson queues, and networks of queues.

CIT-607 Operations Research, 3 cr hrs

This course introduces the fundamentals of operations research, including different techniques for modeling and problem solving. The course will emphasize model-formulation skills, the mathematical procedures of linear programming, network flows, dynamic programming, game theory Markov chains, queuing models, and other problem solving techniques.

CIT-608 Introduction to Convex Optimization Theory, 3 cr hrs

This course focuses on the theory and applications and algorithms of convex optimization. It focuses on recognizing and solving convex optimization problems that arise in many engineering fields. It is divided into three parts; Mathematical background, convex optimization theory, and its applications. The Mathematical background part reviews relevant topics in linear Algebra that are necessary for the students to complete the course. The theory part covers the basics of convex analysis and convex optimization problems such as linear programming (LP), semi-definite programming (SDP), second order cone programming (SOCP), and geometric programming (GP), as well as duality in general convex and conic optimization problems. The third part of the course focuses on engineering applications of convex optimization, from systems and control theory to estimation, data fitting, and information theory.

CIT-609 Network Architecture, 3 cr hrs

The course covers the network evolution and development, network architectures, network topologies and technologies, layered protocol design, OSI model, MAC protocols, multiplexing, switching, flow control, IP networking, addressing, IPv4 vs. IPv6, transmission protocols, TCP/IP networking, routing and queuing, Domain Name System, network management, network performance evaluation, Quality of Service architecture, IntServ, DiffServ, MPLS, Multicasting, VPNs, multimedia transmission protocols, Traffic Engineering, this is in addition to the state-of-the-art of networking applications and services like Cloud Computing, P2P networking & Ubiquitous Computing.

CIT-610 Cloud Computing, 3 cr hrs

The course targets students and IT professionals looking for understanding cloud computing basics, environment and architecture. The course covers cloud infrastructure,

cloud deployment and service models. This is in addition to basic concepts of traditional data centers, virtualization, migrating to cloud computing and deciding for optimal cloud deployment model.

CIT-611 Software Architecture, 3 cr hrs
This course introduces students to the concepts, principles, and state-of-the-art methods in software architectures, including domain-specific software architectures, architectural styles, architecture description languages, their properties and the types of problems for which they are most appropriate, and architecture-based testing and analysis. The course will also examine the practical applicability of architecture research, specifically its relationship to work in architectural frameworks and component interoperability platforms.

CIT-612 Software Project Management, 3 cr hrs
The course provides the necessary knowledge and skills to lead a software project team, understand the software process, time and cost estimates, and the relationship of software development to overall product engineering. Topics include life cycle models, requirements definition, configuration control, environments, planning, scheduling, execution, monitoring, evaluation, refinement, quality assurance as well as team building, organization and motivation, and legal issues involved in liability, warranty, patentability, and copyright. Students participate in group projects and case studies.

CIT-613 Software Testing and Verification, 3 cr hrs
This course presents theoretical and practical aspects of testing software; a comprehensive study of software testing and quality control concepts, principles, methodologies, management strategies and techniques. The emphasis is on understanding software testing process, planning strategy, criteria, and testing methods, as well as software quality assurance concepts & control process. Students participate in the entire range of test activities: analyzing a requirements' document for test conditions; writing a test plan; designing, creating and executing test cases using various testing approaches; recording defects, and writing test reports.

CIT-614 Network Programming and Distributed Object Systems, 3 cr hrs
Prerequisite: CIT-606
Tools, techniques, and design principles behind these systems. Design, deployment, and maintenance issues; multi-tier and peer-to-peer architectures; security and transactional issues that present unique challenges in distributed systems. Concepts to be covered include inter-process communication, remote invocation, data serialization, messaging, integration, distributed design patterns, distributed system architecture, transactions, service lookup, application servers, and performance implications.

CIT-615 Software Development Studio I, 3 cr hrs
The software development studio provides an opportunity for students to apply the knowledge and skills gained in other courses in synthesizing and developing a solution to a

significant, realistic, and practical problem. The work is typically done for an outside client. Students will be working in teams, under the supervision of a faculty member, to analyze a problem, plan a software development project, and implement a solution. Subsequently, they are to evaluate the efficacy of their developed applications.

CIT-616 Software Development Studio II, 3 cr hrs

Prerequisite: CIT-615

The software development studio provides an opportunity for students to apply the knowledge and skills gained in other courses in synthesizing and developing a solution to a significant, realistic, and practical problem. The work is typically done for an outside client. Students will be working in teams, under the supervision of a faculty member, to analyze a problem, plan a software development project, and implement a solution. Subsequently, they are to evaluate the efficacy of their developed applications.

CIT-617 Advanced Software Engineering, 3 cr hrs

This course focuses on critical aspects of the software lifecycle that have significant influence on the overall quality of the software system including techniques and approaches to requirements, design, quantitative measurement and assessment of the system during implementation, testing, configuration, and maintenance, and the role of verification and validation in assuring software quality.

CIT-620 Introduction to Information Security and Cryptography, 3 cr hr

An overview of operating system security; network security, including cryptography and cryptographic protocols, firewalls, and network denial-of-service attacks and defenses; user authentication technologies; security for network servers; web security; and security for mobile code technologies; intrusion detection; techniques to provide privacy in Internet applications; and protecting digital content.

CIT-621 Crypto-Protocols and Network Security, 3 cr hr

Prerequisite: CIT-620

The course covers authentication protocols, key distributions protocols, e-commerce security protocols. Security protocol properties: authentication, secrecy, integrity, availability, non-repudiation, atomicity, certified delivery; crypto-protocol attacks; security protocols design, implementation and analysis. OSI security architecture, models and architectures for network security, authentication, email security, IP security, IPv6, web security, SSL/TLS, VPNs, firewalls, content filtering, denial of service attacks, wireless networks security, network security policies, intrusion detection, misuse detection methods, anomaly detection methods.

CIT-622 Operating Systems & Applications Security, 3 cr hr

Prerequisite: CIT-620

The course covers fundamental concepts and mechanisms for enforcing security and

defining secure operating systems, defining an ideal secure operating system, the first OS designed for security goals, systems development approaches applied to build a secure operating system, access control fundamentals, formal security goals and corresponding security models proposed for secure operating systems, security kernels, secure virtual machine systems, surveying a variety of approaches applied to the development of secure operating systems, system assurance methodologies.

CIT-623 Security in Wireless Ad Hoc Networks, 3 cr hr

Prerequisite: CIT-620

The course covers security measures for different types of wireless networks, the challenges associated with securing ad hoc networks, the different attacks on Ad hoc networks, the different types of intrusion detection systems used for ad hoc networks, the reputation systems as an approach to securing ad hoc networks. Upon completing the course the students will be able to describe the different types of security measures used for wireless networks, describe ad hoc networks characteristics, applications, challenges, and security requirements, to know the types of routing protocols associated with these networks and their design principles, to know the attacks that could be launched on different layers of ad hoc networks, to decide the types of intrusion detection systems that could be used for ad hoc networks according to several factors. This is in addition to being able to criticize different types of reputation systems.

CIT-624 Security Evaluation Methodologies, 3 cr hr

Prerequisite: CIT-620

The course discusses security evaluation of information systems, security evaluation of software, security evaluation of products, security code inspection, security testing, security standards, preparation of a security evaluation: impact scale, likelihood scale, severity scale, vulnerability analysis, risk analysis, security plan elaboration, common criteria, target of evaluation, protection profile, security functional requirement, security factors, errors, accidents, assurance requirements, assurance levels, evaluation process, compliance with the protection profile, and security evaluation case studies.

CIT-625 Security Incident Handling, 3 cr hr

The course provides an overview of security incident response and emergency handling activities. Topics covered include detecting and characterizing an attack; forensics and evidence collection; understanding the technical issues of different attack types; and performing analysis and response tasks for various types of incidents. The course also outlines how to build and manage computer incident response teams.

CIT-626 Information Security Ethics, Policy, and Legal Issues, 3 cr hr

The course covers how to identify and prioritize information assets, identify and prioritize threats to information assets, define an information security policy, develop, implement

and maintain various security policies, implement information security constraints used to prevent misuse of information on an organization's human resources process, and to know the role of culture in ethics as it applies to information security. As a result of completing this course, students will be able to describe the need for and development of information security policies, and identify guidelines and models for writing policies, define risk management and explain why it is an important component of an information security strategy and practice, identify security issues related to personnel decisions, and qualifications of security personnel and to take ethics into consideration while dealing with information security.

CIT-627 Risk Management, 3 cr hr

In this course, students will learn and understand the different components of risk, risk assessment and risk management and how all these components relate; the different types of risk assessment; the frameworks and methodologies of conducting and processing risk management correctly, efficiently and effectively in the enterprise; how to establish an effective risk management for your organization. The course covers risk challenges facing security and risk management, IT Risk & alignment to business objectives, risk domains and risk universe, risk management components & their relations, risk management Processes and life cycles, risk assessment (framework/methodologies), qualitative and quantitative risk assessment, risk appetite & risk tolerance, controls and control objectives, control Self-Assessment, Security and Risk Metrics, risks reporting and communicating, data classification, processing effective & efficient risk management, Outsourcing / Cloud computing and impact to IT Risk. The course includes exercise and walks through Risk Management Process Flows of a real life scenarios and case studies.

CIT-628 Information Security Governance, 3 cr hrs

Prerequisite: CIT-627

The course covers basics of Information Security Governance, Security Governance vs. IT Governance, regulatory requirements for information security, the needs and benefits of the governance approach, Information Security Governance program and its deliverables, establishing the ISG processes in the organization, aligning the ISG to the organization's strategy and goals, the associated roles and responsibilities, maturity models for the governance framework, the related Standards, Governance Codes and Bodies of Knowledge, Offshoring and Outsourcing impacts to Security Governance, developing and managing the Security Metrics, developing and achieving the Security Compliance, establishing risk management objectives and framework, reporting the ISG and effectively working with various stakeholders, e.g. internal and external auditors, legal officers, business owners. The course includes real-life case studies and also addresses the different influences of different industries as well as different legalizations on the Information Security Program.

CIT-630 Design of Communication Systems, 3 cr hrs

Prerequisite: CIT-604, CIT-605

Analysis and design of communication systems; including an overview of analog and digital modulation and demodulation, frequency conversion, multiplexing, noise and distortion; spectral and signal-to-noise ratio analysis, probability of error in digital

systems, spread spectrum. Advanced topics include optimal communication, modulation under bandwidth and complexity constraints, and mobile communication. Practical implementation of the concepts studied is realized through hands-on experiments and projects.

CIT-631 Antennas, 3 cr hrs
Fundamental parameters. Dipoles, loops, reflectors, Yagis, helices, slots, horns, micro-strips. Antennas as transitions between guided and free radiation, ultrasound analogue. Famous antennas. Pattern measurements. Friis and radar equations. Feeds, matching, baluns. Broad banding. Arrays, aperture synthesis, interferometry, very-long-baseline interferometry. Thermal radiation, antenna temperature, microwave passive remote sensing.

CIT-633 Wireless Communications, 3 cr hrs
Prerequisite: CIT-630
Topics covered include MIMO (multiple input multiple output) communication, space-time coding, opportunistic communication, OFDM and CDMA. The concepts are illustrated using many examples from wireless systems such as GSM, IS-95 (CDMA), IS-856(1xEV-DO), Flash OFDM and ArrayComm SDMA systems. Particular emphasis is placed on the interplay between concepts and their implementation in systems.

CIT-634 Advanced Coding and Signal Processing, 3 cr hrs
Prerequisite: CIT-640, CIT-605
The course includes a review sampling and reconstruction, CTFT, DTFT, DFT. It covers multi-rate signal processing: up-sampling and down-sampling, poly-phase filters, sample rate conversion, multistage filter design. Time-Frequency Analysis: uncertainty principle, continuous STFT, discrete STFT, continuous wavelet transform. Wavelets: review of Hilbert spaces, discrete wavelet transform, multi-scale equations, cascade equation. Space-time coding, turbo coding, Branch and Bound Algorithm, adaptive filtering, Trellis decoding and belief propagation decoding and SP. Practical implementation of the concepts studied is realized through hands-on experiments and projects.

CIT-635 Design and Implementation of Wireless Networks, 3 cr hrs
Prerequisite: CIT-633
Overview of current systems and standards. Performance of digital modulation in fading and inter-symbol interference; capacity of wireless channels, flat fading countermeasures-diversity, coding and interleaving, adaptive modulation; multiple antenna systems; inter-symbol interference countermeasures; equalization, multicarrier modulation, spread spectrum and RAKE receivers; multiple access, cellular systems, and ad-hoc networks.

CIT-636 Digital IC Design, 3 cr hr
Dedicated (ASIC) Vs general-purpose chips. Programming of general-purpose processors and DSPs. VHDL design. FPGAs. ASIC design. Design for testability. Hardware/software code-sign using System C.

CIT-637 Detection and Estimation, 3 cr hrs
Introduction to detection and estimation theory with applications. Topics include: maximum likelihood and Bayesian estimates, Kalman filtering, simple and composite hypothesis testing, and detection of signals in noise.

CIT-638 Advanced Networks, 3 cr hrs
Prerequisite: CIT-606
This is an advanced course in communication networks that builds upon the CIT-606 core course (Fundamentals of Networking) to develop understanding of fundamental networking concepts as well as state-of-the-art wireless networking architectures. The course focuses on multiple access, routing and congestion control. In addition, selected topics pertaining to cellular networks, Wireless Local Area Networks (WLANs), mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) will be studied. Time permitting, the topics will include admission control, IEEE 802.11 standard and its variants, scheduling, routing protocols and energy.

CIT640 Convex Optimization, 3 cr hr
This course deals with the theory, applications and algorithms of convex optimization. It focuses on recognizing and solving convex optimization problems that arise in many engineering fields. It is divided into three parts; theory, applications, and algorithms. The theory part covers the basics of convex analysis and convex optimization problems such as linear programming (LP), semidefinite programming (SDP), second order cone programming (SOCP), and geometric programming (GP), as well as duality in general convex and conic optimization problems. In the next part of the course, we will focus on engineering applications of convex optimization, from systems and control theory to estimation, data fitting, and information theory. Finally, in the last part of the course we discuss the details of interior point algorithms.

CIT641 Discrete Stochastic, 3 cr hr
The objective of this class is to help students develop the understanding and intuition necessary to apply stochastic process models to problems in engineering, science and operations research. It contains simple examples and case studies designed to build insight about the structure of stochastic processes and about the generic effect of these phenomena in real systems. The tools and methods developed are imperative specifically for graduate students to do fundamental research in the broad area of communication and networking.

CIT-643 Image Processing and 3D Computer Graphics, 3 cr hrs
This course aims be a comprehensive introduction to the basic concepts and algorithms of digital processing of visual information that would be utilized in the most prominent applications such as medical imaging, remote sensing, space exploration, surveillance, gaming and entertainment, manufacturing and robotics.

The course is divided into two closely-related parts: image processing and computer graphics. The first part focuses on simple engineering concepts for acquisition, restoration, enhancement, and analysis of digital images. The second part covers the basics of three-dimensional computer graphics and the generation of 2D images from 3D models with topics comprising object modeling and representation, rendering, illumination and

animation. As a practical course, the lab work includes implementation of the image processing algorithms using Matlab and developing a visualization tool for surface models using C++/OpenGL.

CIT-644 Scientific Computing, 3 cr hrs
This course covers numerical analysis and solution techniques for common scientific and engineering problems and provides essential foundation for important computational subject areas such as medical imaging, bioinformatics, financial modeling, to name a few. The course covers a variety of topics including numerical approximations and errors, roots of equations, systems of linear algebraic equations, curve fitting, integration, optimization, and numerical solutions for ordinary differential equations. The course will place major emphasis on case studies and practical projects to address realistic computational problems using high-performance numerical techniques that utilize recent advances in grid-computing and graphical processing units (GPUs).

CIT-645 Formal Methods and Computer Algorithms, 3 cr hrs
The course is divided into two parts. The first part handles proofs and proof techniques. It revises the concepts of sets, cardinality, relations, functions, integers, rational numbers and real numbers. It also introduces some algebraic structures such as rings and fields and other structures such as trees and graphs. It also covers Automata and languages, and handles computability and complexity theories. The second part of the course presents the art of designing and analyzing computer algorithm to solve versatile problems. The course will handle graph and tree algorithms, greedy algorithms, divide-and-conquer technique, dynamic programming methodology, NP and Computational Intractability, approximation algorithms, and random algorithms.

CIT-646 Machine Learning and Data Mining, 3 cr hrs
The course is divided into two parts. The first part provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning; unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs; VC theory; large margins); Neural Networks, Decision Trees, Local Models, Model selection, Combining Multiple Learners, reinforcement learning and adaptive control. The second part of the course applies machine learning techniques to Data Mining concepts and algorithms. It focuses on using tabular data sets and introduces examples of the key algorithmic methods used in each task: Classification, Clustering and Association Rule Induction. It also describes the problems related to mining unstructured data in general and presents selected feature representation and selection methods, information retrieval models, and information extraction approaches. The course will include both hand worked tutorials and applied lab work using the WEKA, Carrot2, and GATE systems.

CIT-647 Mathematical Methods in Visual Computing, 3 cr hrs
This course provides a comprehensive overview on the mathematical techniques and methods used in visual computing applications. The course contains two central themes: inverse problems in image processing; and statistical visual information analysis. The first theme introduces linear and non-linear inverse problems related to imaging and their

solutions. This includes regularization methods for ill-posed problems and solutions to large scale inverse problems. The second theme introduces basic statistical methods of image restoration and analysis. This covers modeling of image intensity distribution, local smoothing filters, wiener filters, image segmentation, and shape analysis. The materials in this course emphasize the theoretical mathematical foundations of image processors as well as the practical implementation and numerical case studies of real imaging problems.

CIT-650 Introduction to Big Data, 3 crhrs

The capability of collecting and storing huge amounts of versatile data necessitate the development and use of new techniques and methodologies for processing and analyzing big data. This course provides a comprehensive covering of a number of technologies that are at the foundation of the Big Data movement. The Hadoop architecture and ecosystem of tools will be of special focus to this course. Students who complete this course will understand the architecture of Hadoop clusters at both the hardware and system software levels. Students will learn to apply Hadoop and related Big Data technologies in developing analytics and solving the types of problems faced by enterprises today. The course strongly emphasizes implementation of big data routines using Java and Python.

CIT-651 Statistical Analysis and Machine Learning, 3 crhrs

This course provides an introduction to machine learning and statistical data analysis. The first part of the course covers topics such as parameter estimation, hypothesis testing and regression analysis. The second part includes machine learning topics such as supervised learning; unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs; VC theory; large margins); Neural Networks, Decision Trees, Local Models, Model selection, Combining Multiple Learners, reinforcement learning and adaptive control. During this course, students will learn how to solve real-life problems using state-of-the-art technologies developed for machine learning computing and data analyses.

CIT-652 Advanced Big Data Analytics, 3 crhrs

This course acts as an applied course where students can develop on their combined knowledge of BigData technologies (e.g. Hadoop, Spark, etc.) and Data Science (e.g. Statistics, Machine Learning, etc.) and understand how such combination is used to solve real-world applications. In addition to this main goal, the course has the additional goal of familiarizing students with the latest technological and scientific trends in the field and how Big Data and data science are used in modern business enterprises. Use cases of real problems such as networking traffic, text analytics, and financial applications will be addressed in this course.

CIT-653 Data Mining, 3 crhrs

This course provides an introduction to data mining concepts over structured and un-structured data with special emphasis on practical applications of this important research area. Data Mining usually involves the extraction and discovery of useful knowledge from raw data. The discovery process, also known as knowledge discovery,

includes feature selection, data cleaning, and coding and entails the use of different statistical and machine learning techniques. The course will cover these areas. Throughout the whole process, students will be provided with examples that will serve to illustrate concepts being introduced. Students will also learn how to solve real-life problems using state-of-the-art technologies for data analyses.

CIT-660 Digital Forensics, 3 cr hr

Prerequisite: CIT-620

This course aims to teach student how to conduct a digital forensics analysis of the file system, e.g. NTFS and FAT, volatile memory, and network traffic, using a sound digital investigation process. It begins by a basic background of interoperating raw-data and timestamps. Then NTFS and FAT file system layout will be discussed in details. The basic of memory acquisition, analysis and evidence extraction will also be introduced during the course. Finally, different topic may cover after the essential topics get introduced, such as data carving, evidence inference and reconstructing the digital crime scene.

CIT-661 Malware Analysis, 3 cr hr.

Prerequisite: CIT-620

The course aims to teach the students how to detect, analyzing and track a malicious program. It begins, by introducing the basics of reverse engineering concepts and using tools like IDA pro to analyze x86 malicious code. The concept of static and dynamic malware analysis will be introduced gradually through the course. After, the techniques commonly employed by malware to thwart the analysis process will be inspected. Finally, the business model of the underground economy of the malware-based cybercrimes will be discussed. The course is self-contained. However, a good knowledge of programming, computer architecture, operating systems and compiler are highly desired.

CIT-662 Systems Exploitation, 3 cr hr

Prerequisite: CIT-620

Software is commonly vulnerable to flaws and bugs that affect the program logic, intention, and executions. These vulnerabilities are further allowing an attacker to execute arbitrary malicious code on a target system. This class will cover both the identification of software vulnerabilities and the most common techniques used to exploit them. In addition, current existing techniques that attempt to remediate the threat of software vulnerability exploitation will be discussed.

CIT-663 Mobile Applications Security, 3 cr hr

Prerequisite: CIT-620

This course exposes the mobile hacking techniques and countermeasures for iOS and Android. Student will practice how to analyze and evaluate mobile application threats as well as exploring how the attackers identify weaknesses. This course is designed to equip the student with the required knowledge and skills in securing mobile devices, mobile applications and mobile networks of their organization. You will also gain a deeper

understanding on how to conduct mobile penetration testing and how to support BYOD infrastructures.

CIT-690 Selected Topics in CIT (3 cr hrs), could be repeated for credit if content changes.
Prerequisite: Approval of Program Director and consent of Instructor
This course covers current and emerging topics in the field of CIT.

CIT-699 Independent Studies in CIT (1, 2, 3 cr hr)
Prerequisite: Approval of Program Director and consent of Instructor
Supervised and directed individual study and research in special topics of relevance to the field of CIT.

CIT-700 MS Thesis, 9 cr hrs
Supervised thesis work in fundamental research or applied problems.

CIT-710 Project, 3 cr hr. Can be repeated up to 6 cr.
Extended hands-on project in an applied problem, typically from industry.