

ASSIUT UNIVERSITY



**Information Technology
Undergraduate Program
2017-2018**



**Faculty of
Computers and Information**
Dept. of Information Technology



Assiut University

Faculty of Computers &
Information

Information Technology Program

(Credit Hours System)

2017 -2018



IT Program

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*Program
Specifications*



IT Program Specifications

A. Basic Information

1. **Program Title:** Information Technology
2. **Program Type:** Single
3. **Faculty (Faculties):** Faculty of Computers and Information
4. **Department:** Information Technology
5. **Assistant Coordinator:** Dr. Islam A.T.F. Taj-Eddin
6. **Coordinator:** Prof. Hosny M. Ibrahim
7. **External evaluator(s):**-----
8. **Last date of program specifications approval:** 2017- 2018

B. Professional Information

1. Aims and Objectives

1. Information Technology can be seen as the complement of Information Systems. Its emphasis is on the technology itself more than on the information it conveys. IT is a new and rapidly growing field that started as a grassroots response to the practical, everyday needs of business and other organizations. Information Technology focuses on ensuring that the organization's infrastructure is appropriate and reliable and using computing to meet the needs of technology dependent organizations.
2. Information technology refers to undergraduate degree programs that prepare students to meet the computer technology needs of business, government, healthcare, faculties, and other kinds of organizations. In some nations, other names are used for such degree programs.
3. IT programs exist to produce graduates, who possess the right combination of knowledge and practical expertise to take care of both an organization's information technology infrastructure and the people who use it, planning and management of the technology lifecycle by which an organization's technology is maintained, upgraded, and replaced. Graduates of information technology programs address these needs. Information Technology (IT) in its broadest sense encompasses all aspects of computing technology.
4. IT, as an academic discipline, focuses on meeting the needs of users within an organizational and societal context through the selection, creation, application, integration and administration of computing technologies.
5. IT programs aim to provide IT graduates with the skills and knowledge to take on appropriate professional positions in Information Technology upon graduation and grow into leadership positions or pursue research or graduate studies in the field.

2. Graduate attributes

The program aims to provide the student with both breadth and depth of knowledge in the concepts and techniques related to the design, programming, and application of computing systems. Specifically, based on the constitutions of the Computing Curricula According to (NARS for Computing and Information-October 2010) and (ACM/IEEE IT2008) a four-year IT program aims to help IT graduate to acquire a skill set that enables him or her to successfully perform integrative tasks, including the ability to:

- I. Apply the fundamental theories and principles of computing and information applications.
- II. Integrate and evaluate the computing tools and facilities.
- III. Apply knowledge of mathematics and science.
- IV. Design a computing system, component and process to meet the required needs within realistic constraints
- V. Exploit the techniques, skills and up-to-date computing tools, necessary for computing and information practice.
- VI. Display professional responsibilities and ethical, societal and cultural concerns
- VII. Use, compare and evaluate a range of formal and informal techniques, theories and methods to develop computing and information applications.
- VIII. Consider and deal with the individual, social, environmental, organizational and economic implications of the application of computing and information.
- IX. Carry out a work plan with minimal supervision.
- X. Communicate effectively.
- XI. Hold knowledge and skills required by the computing and information industry.
- XII. Engage in self and life-long learning and research in computing and information.
- XIII. Fulfill requirements of potential employers.
- XIV. Knowledge of computing and mathematics appropriate to the discipline
- XV. Analyze a problem, and identify and define the computing requirements appropriate to its solution
- XVI. Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- XVII. Demonstrate independent critical thinking and problem solving skills and function effectively on a team to accomplish a common goal.
- XVIII. An understanding of professional, ethical, legal, security and social issues and responsibilities
- XIX. Communicate effectively with a range of audiences
- XX. Analyze the local and global impact of computing on individuals, organizations, and society
- XXI. Recognition of the need for and an ability to engage in continuing professional development
- XXII. Use current techniques, skills, and tools necessary for Information technology practice and in the creation of an effective project plan
- XXIII. Use and apply current technical concepts and practices in the core information technologies subjects.
- XXIV. Identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems.
- XXV. Address information technologies problems of organizations or individuals.
- XXVI. Effectively integrate IT-based solutions into the user environment
- XXVII. Understand the best practices and standards and their application

3. Intended Learning Outcomes (ILOs)

a. Knowledge and Understanding

The Information Technology graduate should be able to:

- a1. Demonstrate basic knowledge and understanding of fundamental principles of computer architectures and operating systems and how these support IT-based applications.
- a2. Demonstrate basic knowledge and understanding of fundamental principles of computer communications and networks, and distributed computing and how these support IT-based applications.
- a3. Demonstrate strong knowledge of fundamentals of programming and the construction of data structures and algorithms.
- a4. Demonstrate strong knowledge of fundamentals of programming and the construction of computer-based systems, software engineering techniques and information retrieval.
- a5. Show a critical understanding of the theory and methods of systems analysis and design.
- a6. Show a critical understanding of technologies for the design, development and management of multi-user database systems and the implementation of database systems and information retrieval systems.
- a7. Have a comprehensive knowledge and critical awareness of the role of human factors in the design of Information Technology systems, issues of human-computer interaction, graphics and sound and multi-media theory and applications, interfacing and cognition.
- a8. Know methods for the construction of web-based systems, design of internet-based systems.
- a9. Provide a deeper understanding of legal, professional and moral aspects of the exploitation of IT.
- a10. Show a critical understanding of the broad context within computer information technology such as quality, reliability, enterprise, employment law, accounting, business and management and health.
- a11. Show a critical understanding of the challenges inherent in the maintenance and evolution of IT-based systems, and the techniques and best practices currently available for dealing with them.
- a12. Provide a deeper understanding of some aspects of the subject, such as image processing, computer and communication network, data mining and knowledge discovery, information storage and retrieval systems, mobile Communication Systems, pattern recognition, digital signal processing, speech recognition, artificial Intelligence, cryptography and network security, network programming and web services.
- a13. Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.
- a14. Know the principles and techniques of a number of application areas informed by the research directions of IT areas.
- a15. Describe the tools, practices and methodologies used in the specification, design, implementation and critical evaluation of computer software systems.
- a16. Describe the methods used in defining and assessing criteria for measuring the extent to which a computer system is appropriate for its current deployment and future evolution.
- a17. Know the principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.

b. Intellectual Skills

The Information Technology graduate should be able to:

- b1. Define traditional and nontraditional information technology systems problems, set goals towards solving them, observe results, reason and apply judgment.
- b2. Identify attributes, components, relationships, patterns, main ideas, and errors.
- b3. Summarize the proposed solutions and their results.

- b4. Restrict solution methodologies upon their results.
- b5. Establish criteria, and verify solutions.
- b6. Identify a range of solutions and critically evaluate and justify proposed design solutions.
- b7. Solve information technology problems with pressing commercial or industrial constraints.
- b8. Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.
- b9. Perform problem analysis from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis).
- b10. Create designs to satisfy given requirements (synthesis, evaluation, application).
- b11. Recognize the professional, moral and ethical issues involved in the exploitation of Information Technology and be guided by their adoption, reflect on issues of professional practice within the discipline.
- b12. Apply the concepts, principles, theories and practices underpinning computing as an academic discipline.
- b13. Define criteria to measure the appropriateness of a computer system for its current deployment and future evolution, and to interpret the results thereof.
- b14. Analyze alternative computer systems and processes taking into account limitations, constraints, fit-for-purpose, general quality, and possible trade-offs within the parameters of the problem.
- b15. Synthesize ideas, proposals and designs effectively using rational and reasoned arguments for presentation to a range of audiences.
- b16. Generate the results of tests to investigate the functionality of computer systems.
- b17. Reach computing judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact.
- b18. Read research papers in a range of knowledge areas.

c. Professional and Practical Skills

The Information Technology graduate should be able to:

- c1. Specify, investigate, analyze, design and develop computer-based systems using appropriate tools and techniques.
- c2. Evaluate systems in terms of their quality and possible trade-offs, evaluate appropriate hardware and software solutions for given scenarios.
- c3. Recognize risks or safety aspects involved in the operation of computer-based systems.
- c4. Effectively deploy tools for the implementation and documentation of computer-based systems.
- c5. Operate computing equipment efficiently, taking into account its logical and physical properties.
- c6. Recognize and address professional, moral and ethical issues within the discipline.
- c7. Show an in-depth knowledge of appropriate aspects of Information Technology.
- c8. Use investigative skills to research new and novel aspects of their work
- c9. Make effective use of general IT facilities, plan and manage a project to complete within budget and schedule
- c10. Recognize the need for continuing professional development in recognition of the need for lifelong learning.
- c11. Apply tools and techniques for the design and development of applications and projects.

d. General and Transferable Skills

The Information Technology graduate should be able to:

- d1. Collaborate effectively within multidisciplinary team.
- d2. Work in stressful environment and within constraints.
- d3. Communicate effectively.
- d4. Demonstrate efficient IT capabilities.

- d5. Lead and motivate individuals.
- d6. Manage tasks and resources.
- d7. Search for information and adopt life-long self-learning.
- d8. Work as part of a development team and to recognize the different roles of its members.
- d9. Employ information-retrieval skills, (including the use of browsers, search engines, and on-line library catalogues), communicate effectively using a variety of communication methods, and communicate effectively with team members, managers and customers.
- d10. Work independently and as part of a team with minimum guidance.
- d11. Prepare their work in the form of reports, oral presentations or an internet web site.
- d12. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.

4. Academic standards

4a. External references for standards

The academic standards invoked in this specification are driven from the computing academic standards approved by the National Sector Committee for Computers and Informatics.

4b. Comparison of provision to external references

See the attached document “Academic Standards Matrices”.

5. Curriculum Structure and Content

5a. Program duration: 144 credit hours.

5b. Program structure

- No. of credit hours of Compulsory (100), Elective (44)
- No. of program Levels (in credit-hours system): 4 levels.

The following table summarizes the program structure.

Table 1. Components of the Program	Subject Area	Credit Hours	Credit %	Tolerance %
	Humanities and social sciences (Univ. Req.)	18	12.5%	8-10%
	Mathematics and basic sciences	28	19.44%	16-18%
	Basic computing sciences (Faculty/Spec. Req.)	42	29.17%	26-28%
	Applied and of specialized computing sciences	42	29.17%	28-30%
	Projects and practice	14	9.72%	6-10%
	Total	144	100 %	84-96%
	Optional (Institution character-identifying subjects)	15	N/A	16-4%
Total	N/A	N/A	100%	

6. Program Courses

6a. First Year of IT Program

Table 2. a) Compulsory Courses (28 credit hours)

Code/ course No.	Course Title	Prerequisites	Credits	No. of hours /week			Achieved (NARS) ILOs
				Lect.	Lab	Exer.	
CS141	Programming Fundamentals	IT101	3	3	3	-	a1,a2,a3,a4,a5-a9, a13,b1-b5,c1-c3,d1-d5
IT101	IT Fundamentals	-	3	3	3	-	a1-a6,a8,a9, a13,b1- b3,c1-c4,d1-d4
MATH101	Mathematics I	-	3	3	-	2	a1,a2, a13,b1-b6,c1- c3,d1,d3
MATH102	Mathematics II	MATH101	3	3	-	2	a1-a5, a13,b1-b6,c1- c4,d1,d3
PHYS101	Physics I	-	3	2	2	-	a1-a6, a13,b1-b4,c1- c6,d1-d6
PHYS102	Physics II	-	3	2	2	-	a1-a7, a13,b1-b4,c1- c5,d1-d6
EE101	Electronics	-	3	2	2	-	a1-a5, a13,b1-b6,c1- c5,d1-d6
EE102	Digital Circuits	EE101	2	2	2	-	a1-a8, a13,b1-b8,c1- c5,d1-d5
HUM111	English Language I	-	2	2	-	-	a1, a13,b1,b2,c1- c3,d1-d7
HUM121	Social Context of Computing	-	1	1	-	-	a1-a3, a13,b1-b3,c1- c3,d1-d9
HUM132	Interpersonal Communication	-	2	2	-	-	a1-a3, a13,b1-b3,c1- c3,d1-d9

	Code/ course No.	Course Title	Prerequisites	Credits	No. of hours /week			Achieved (NARS) ILOs
					Lect.	Lab	Exer.	
Table 3. b) Elective Courses (choose only 8 credit hours)	HUM112	English Language II	HUM111	2	2	-	-	a1,a2, a13,b1-b3,c1-c3, d1-d7
	HUM122	Intellectual Property	-	1	1	-	-	a1,a2, a13,b1-b3,c1-c3,d1-d7
	HUM131	Organizational Behavior	-	2	2	-	-	a1,a2, a13,b1-b3,c1-c3,d1-d7
	HUM133	Computing Economics	-	2	2	-	-	a1-a6, a13,b1,b2,c1-c3,d1-d7
	HUM141	Computer Law	-	2	2	-	-	a1-a5, a13,b1-b5,c1,c3,d1-d4
	HUM142	Privacy and Civil Liberties	-	1	1	-	-	a1-a5, a13,b1-b4,c2,c3,d1-d3
	HUM151	Hand Drawing	-	2	1	3	-	a1-a4, a13,b1,b4,c1-c3,d1-d3
	HUM152	History of Computing	-	2	2	-	-	a2,a4-a6,a9, a13,b1-b3,c1,c2,c4,d1-d3
	HUM153	Islamic Culture	-	1	1	-	-	a1-a3, a13,b2,b3,c1,c3,d2,d3
	HUM154	Scientific Thinking	-	1	1	-	-	a1,a2, a13,b1,b2,c1,d1-d3

6b. Second year of IT Program

Table 4. a) Compulsory Courses (27 credit hours)

Code/ course No.	Course Title	Prerequisites	Credits	No. of hours /week			Achieved (NARS) ILOs
				Lect.	Lab	Exer.	
CS201	Discrete Structures	MATH102	3	3	-	2	a1,a2, a13,b1-b6,c1-c4,d1-d4
CS211	Data Structures and Algorithms	CS241	3	3	2	-	a1-a5, a13,b1-b11,b18,c1-c7,d1-d6
CS241	Object Oriented Programming	CS241	3	3	2	-	a1-a5, a13,b1,b2-b5,c1-c4,d1-d6
IS212	Databases	IS201	3	3	2	-	a1-a7, a13,b1-b5,c1-c6,d1,d3-d6
IS221	Project Management	IT101	2	2	-	2	a1,a2, a13,b1,c1,d2-d6
IT251	Data Communications	IT101	3	3	-	2	a1-a7, a13,b1-b6,c1-c5,d1-d6
CE221	Computer Architecture	CS141, CS201	3	3	2	-	a1-a8, a13,b1-b4,c1-c3,d1-d4
MATH202	Probability and Statistics	MATH102	2	2	2	-	a1-a5, a13,b1-b6c1-c4,d1-d3,
HUM231	Business Administration	-	2	2	-	-	a1,a2, a13,b1-b3,c1-c3,d1-d7
HUM232	Technical Writing	HUM111	2	2	-	2	a1-a3, a13,b1-b3,c1-c3,d1-d9
HUM241	Computers and Ethics	-	1	1	-	-	a1,a2, a13,b1,b3,c1,c2,d1-d7

Code/ course No.	Course Title	Prerequisites	Credits	No. of hours /week			Achieved (NARS) ILOs
				Lect.	Lab	Exer.	
IS201	Foundations of Information Systems	IT101	3	3	2	-	a1-a8, a13,b1-b10,c1-c6,c8,d1,d3-d7
IS211	File Organization	CS241	3	3	2	-	a1-a4,a6-a9, a13,b1-b4,c1-c6,d1-d6
IS231	Systems Analysis and Design	IT101	3	3	-	2	a1-a8, a13,b1-b8,b11-b15,b18,c1-c5,d1-d8
MATH201	Mathematics III	MATH102	3	3	-	2	a1-a3, a13,b1-b5,c1,c4,d1-d4
EE201	Digital Signal Processing	MATH201	3	3	2	-	a1-a3, a13,b1-b5,c1,c4,d1-d4

Table 5. b) Elective Courses (choose only from 0 to 12 credit hours)

6c. Third year of IT Program

Table 6. a) Compulsory Courses (30 credit hours)	Code/ course No.	Course Title	Prerequisites	Credits	No. of hours /week			Achieved (NARS) ILOs
					Lect.	Lab	Exer.	
					CS321	Operating Systems	CE221	
CS351	Computer Graphics	IT101, CS201	3	3	2	-	a1-a7, a13,b1-b6,c1-c4,d1-d6	
CS352	Image Processing	CS211	3	3	2	-	a1-a8, a13,b1-b6,c1-c5,d1-d6	
CS381	Software Development and Professional Practice	CS211, CS391	3	3	2	-	a1-a10, a13,b1-b15,c1-c6,d1-d6	
CS391	Software Engineering	IS231	3	3	-	2	a1-a10, a13,b1-b15,c1-c6,d1-d6	
IT311	Network Security	IT351	3	3	-	2	a1-a8, a13,b1-b9,c1-c7,d1-d6	
IT331	Network Management	IT351	3	2	3	-	a1-a7, a13,a17,b1,b2,b4,c1-c4,d1-d6	
IT351	Computer Networks	IT251, CE221	3	3	2	-	a1-a10, a13,a17,b1-b5,c1-c7,d1-d9	
IT361	Field Training	IS221	3	-	-	-	a1-a9, a13,b1-b15,c1-c5,d1-d11	
IT371	Web Programming	IT251 , IT101	3	3	2	-	a1-a8, a13,b1-b3,c1-c5,d1-d7	

Table 7. b) Elective Courses (choose only from 0 to 15 credit hours)	Code/ course No.	Course Title	Prerequisites	Credits	No. of hours / week			Achieved (NARS) ILOs
					Lect.	Lab	Exer.	
					CS301	Operation Research	CS201	
CS302	Simulation and Modeling	MATH202	3	3	2	-	a1-a4, a13,b1-b4,c1,c2,d1,d3	
CS341	Visual Programming	CS211	3	3	2	-	a1-a6, a13,b1-b5,c1-c5,d1-d6	
IS321	Advanced Project Management	IS221	3	3	-	2	a1,a2, a13,b1,c1,d1	
MM301	Introduction to Multimedia Technology	CS241	3	3	2	-	a1 , a2,a3 , a13,b1-b4,c1,c2, c3-c7 , d1-d9	
MATH301	Numerical Analysis	MATH102	3	3	-	2	a1-a3, a13,b1-b6,c1-c7,d1-d7	

6d. Fourth year of IT Program

Code/ course No.	Course Title	Prerequisites	Credits	No. of hours /week			Achieved (NARS) ILOs
				Lect.	Lab	Exer.	
IT431	Wireless and Mobile Computing	IT251	3	3	2	-	a1-a4,a7-a9, a13,b1-b6,c1- c5,d1-d7
IT451	Network Analysis and Design	IT351, MATH202	3	3	2	-	a1-a10, a13,b1- b13,c1-c7,d1-d7
IT441	Enterprise Architecture	IT351	3	3	-	2	a1-a6, a13,b1- b5,c1-c6,d1-d5
IT461	Project I	CS381, IS221	3	1	4	-	a1-a9, a13,b1- b16,c1-c5,d1-d11
IT462	Project II	CS381, IS221	3	1	4	-	a1-a9, a13,b1- b16,c1-c5,d1-d11

Table 8. a) Compulsory Courses (15 credit hours)

	Code/ course No.	Course Title	Prerequisites	Credits	No. of hours /week			Achieved (NARS) ILOs
					Lect.	Lab	Exer.	
Table 9. b) Elective Courses (choose only from 21 to 24 credit hours)	IT432	Network Programming	IT351	3	3	2	-	a1-a9, a13,b1-b6,c1-c5,d1-d7
	IT471	E-Commerce	IT371	3	3	-	2	a1-a6, a13,b1,b2,c1-c3,d1-d7
	IT433	Network Forensics	IT351	3	3	-	2	a1-a17, a13,b1-b7,c1-c7,d1-d4
	IT452	Networked Embedded Systems	IT351, CE422	3	3	-	2	a1-a7, a13,b1-b5,c1-c5,d1-d6
	CS451	Computer Animation	CS352	3	3	2	-	a1-a5, a13,b1-b3,c1-c6,d1-d4
	CS431	Parallel Computation	CS311, CS321	3	3	2	-	a1-a9, a13,b1-b5,c1-c4,d1-d4
	CS452	Computer Vision	CS241, PHYS102	3	3	2	-	a1-a3, a13,b1-b4,c1-c3,d1-d5
	CS461	Intelligent Systems	CS361	3	3	-	2	a1-a4, a13,b1-b3,c1-c4,d1-d4
	IS411	Advanced Database	IS212	3	3	-	2	a1-a3, a13,b1-b6,c1,c2,d1-d6
	IS412	Distributed and Object Databases	IS212	3	3	-	2	a1-a3, a13,b1-b6,c1,c2,d1-d6
	MM411	Virtual Reality	CS352	3	3	-	2	a1-a4 , a13, b1,b3,b5 , c1-c6 , d1-d6
	CE421	Advanced Computer Architecture	CE221	3	3	-	2	a1-a6, a13,b1-b5,c1-c6,d1-d5
	CE422	Embedded Systems	CE221	3	3	-	2	a1-a8,a13, b1-b5,c1-c5,d1,d2

7. Contents of Courses

Syllabus: See the below

8. Program Admission Requirements

High score in secondary school education certificate in (mathematic section)

9. Regulations for progression and program completion

Please, refer to faculty bylaw (curriculum of undergraduate programs), 2011.

10. Student Assessment (Methods and rules for student assessment)

	Method (tool)	Intended leaning outcomes assessed
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Table 10. 9. Student Assessment (Methods and rules for student assessment)	1- Written examinations	Knowledge and Understanding - Intellectual Skills - Professional Skills - General Skills
	2- Oral examination	Knowledge and Understanding - Intellectual Skills
	3- Laboratory examination	Professional Skills - General Skills
	4- Graduation project	Professional Skills - General Skills
	5- Reports and homework	Knowledge and Understanding

11. Program Evaluation

Table 11. 10. 9. Program Evaluation	Evaluator	Tool	Sample
	1- Senior students	Questionnaires	-----
	2- Alumni	Questionnaires	-----
	3- Stakeholders (Employers)	Questionnaires, Joint Discussion	-----
	4- External Evaluator(s)	Review Reports	-----

IT Program Matrices



*Assiut University
Faculty of Computers & Information
Department of Information Systems
Quality Assurance Unit*

IT Program Matrices



The main description of Information Technology Program can be summarized in different types of matrices. These matrices are:

1. Academic Standards Matrix

This matrix shows the ILOs invoked in IT Program Specifications and those existing in NARS and the corresponding between them.

2. Program Matrix I (Courses – NARS General)

This matrix shows how IT Program Courses can cover the NARS general ILOs.

3. Program Matrix II (Courses – NARS Special)

This matrix shows how IT Program Courses can cover the NARS special ILOs.

4. Program Matrix III (Courses – Knowledge and Understanding Skills)

This matrix shows how IT Program Courses can cover Knowledge and Understanding Skills invoked in IS Program Specifications.

5. Program Matrix IV (Courses – Intellectual Skills)

This matrix shows how IT Program Courses can cover Intellectual Skills invoked in IT Program Specifications.

6. Program Matrix V (Courses – Professional and Practical Skills)

This matrix shows how IT Program Courses can cover Professional and Practical Skills invoked in IT Program Specifications.

7. Program Matrix VI (Courses – Transferable Skills)

This matrix shows how IT Program Courses can cover Transferable Skills invoked in IT Program Specifications.

8. Program Matrix (Courses –IT Programs)

This matrix shows how IT Program Courses can cover IT Program ILOs.

9. Program Matrix VII (Aims – ILOs)

This matrix shows how IT Program ILOs can cover the program aims.

10. Teaching and Learning Methods Matrix VIII (ILOs-Teaching and Learning Methods)

This matrix shows what teaching methods are covered by IT Program ILOs.

11. Assessment Methods Matrix VIII (ILOs-Assessment Methods)

This matrix shows what assessment methods are covered by IT Program ILOs

Academic Standards (Knowledge and Understanding Skills)(March 2010)

IT Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
a1. Demonstrate basic knowledge and understanding of fundamental principles of computer architectures and operating systems and how these support IT-based applications.	A1	K1, K4	K1.Essential facts, concepts, principles and theories relating to computing and information and computer applications as appropriate to the program of study.	A1. Demonstrate basic knowledge and understanding of fundamental principles of core computing.
a2. Demonstrate basic knowledge and understanding of fundamental principles of computer communications and networks, and distributed computing and how these support IT-based applications.	A1	K1, K4	K2. Modeling and design of computer-based systems bearing in mind the trade-offs.	A2. Demonstrate strong knowledge of fundamentals of programming and the construction of computer-based systems, data structures and algorithms, software engineering techniques and information retrieval.
a3. Demonstrate strong knowledge of fundamentals of programming and the construction of data structures and algorithms.	A2	K1	K3.Tools, practices and methodologies used in the specification, design, implementation and evaluation of computer software systems.	A3. Provide a deeper understanding of some aspects of the subject, such as multimedia, computer and communication network, data mining and knowledge discovery, information storage and retrieval systems, mobile Communication Systems, pattern recognition, artificial Intelligence, cryptography and network security.
a4. Demonstrate strong knowledge of fundamentals of programming and the construction of computer-based systems, software engineering techniques and information retrieval.	A2	K1	K4.Criteria and specifications appropriate to specific problems, and plan strategies for their solution.	A4. Show the understanding of technologies for the design, development and management of database systems, systems analysis and design and of information retrieval systems.
a5. Show a critical understanding of the theory and methods of systems analysis and design.	A3	K2	K5.The extent to which a computer-based system meets the criteria defined for its current use and future development.	A5. Know the role of human factors in the design of Information Technology systems.
a6. Show a critical understanding of technologies for the design, development and management of multi-user database systems and the implementation of database systems and information retrieval systems.	A3	K2	K6.The current and underlying technologies that support computer Processing and inter-computer communication.	A6. Apply tools and techniques for the design and development of applications.
a7. Have a comprehensive knowledge and critical awareness of the role of human factors in the design of Information Technology systems, issues of human-	A4	K2	K7.Principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.	A7. Know methods for the construction of web-based materials and systems, design of internet-based systems.

IT Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
computer interaction, graphics and sound and multi-media theory and applications, interfacing and cognition.				A8. Provide an understanding of legal, professional and moral aspects of the exploitation of IT.
a8. Know methods for the construction of web-based systems, design of internet-based systems.	A6		K8.Management and economics principles relevant to computing and information disciplines.	A9. Understand the broad context within computer information technology such as quality, reliability, enterprise, employment law, accounting and health.
a9. Provide a deeper understanding of legal, professional and moral aspects of the exploitation of IT.	A7	K7	K9.Professional, moral and ethical issues involved in the exploitation of computer technology and be guided by the appropriate professional, ethical and legal practices relevant to the computing and information industry.	A10. Understand the challenges inherent in the maintenance and evolution of IT based systems, and the techniques and best practices currently available for dealing with them.
a10.Show a critical understanding of the broad context within computer information technology such as quality, reliability, enterprise, employment law, accounting, business and management and health.	A8	K6	K10.Current developments in computing and information research.	
a11.Show a critical understanding of the challenges inherent in the maintenance and evolution of IT-based systems, and the techniques and best practices currently available for dealing with them.	A9	K3	K11. Requirements, practical constraints and computer-based systems	
a12.Provide a deeper understanding of some aspects of the subject, such as image processing, computer and communication network, data mining and knowledge discovery, information storage and retrieval systems, mobile Communication Systems, pattern recognition, digital signal processing, speech recognition, artificial Intelligence, cryptography and network security, network programming and web services.	A10			
a13.Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.	A1			

IT Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
a14. Know the principles and techniques of a number of application areas informed by the research directions of IT areas.		K8		
a15. Describe the tools, practices and methodologies used in the specification, design, implementation and critical evaluation of computer software systems.		K2		
a16. Describe the methods used in defining and assessing criteria for measuring the extent to which a computer system is appropriate for its current deployment and future evolution.		K3		
a17. Know the principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.		K5		

Academic Standards (Intellectual Skills)

IT Program ILOs	Corresponding in NARS		NARS ILOs – General	NARS ILOs – Special
b1. Define traditional and nontraditional information technology systems problems, set goals towards solving them, observe results, reason and apply judgment.		B1	I1. Analyze computing problems and provide solutions related to the design and construction of computing systems.	B1. Information technology systems problems, set goals towards solving them, observe results, reason and apply judgment.
b2. Identify attributes, components, relationships, patterns, main ideas, and errors.		B2	I2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.	B2. Identify attributes, components, relationships, patterns, main ideas, and errors.
b3. Summarize the proposed solutions and their results.		B3	I3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.	B3. Summarize the proposed solutions and their results.
b4. Restrict solution methodologies upon their results.		B4		B4. Restrict solution methodologies upon their results.
b5. Establish criteria, and verify solutions.		B5		B5. Establish criteria, and verify solutions

b6. Identify a range of solutions and critically evaluate and justify proposed design solutions.		B6	<p>I4. Analyze alternative computer systems and processes taking into account limitations, and quality constraints.</p> <p>I5. Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems.</p> <p>I6. Evaluate the results of tests to investigate the functionality of computer systems.</p> <p>I7. Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact.</p> <p>I8. Familiar with the professional, legal, moral and ethical issues relevant to the computing industry.</p> <p>I9. Evaluate research papers in a range of knowledge areas.</p>	<p>B6. Identify a range of solutions and critically evaluate and justify proposed design solutions.</p> <p>B7. Solve information technology problems with pressing commercial or industrial constraints.</p> <p>B8. Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.</p> <p>B9. Perform problem analysis from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis).</p> <p>B10. Create and/or justify designs to satisfy given requirements (synthesis, evaluation, application).</p> <p>B11. Recognize the professional, moral and ethical issues of involved in the exploitation of Information Technology and be guided by their adoption, reflect on issues of professional practice within the discipline.</p>
b7. Solve information technology problems with pressing commercial or industrial constraints.		B7		
b8. Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.		B8		
b9. Perform problem analysis from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis).	I1	B9		
b10. Create and/or justify designs to satisfy given requirements (synthesis, evaluation, application).	I3, I8	B10		
b11. Recognize the professional, moral and ethical issues involved in the exploitation of Information Technology and be guided by their adoption, reflect on issues of professional practice within the discipline.	I9	B11		
b12. Apply the concepts, principles, theories and practices underpinning computing as an academic discipline.	I2			
b13. Define criteria to measure the appropriateness of a computer system for its current deployment and future evolution, and to interpret the results thereof.	I4			
b14. Analyze alternative computer systems and processes taking into account limitations, constraints, fit-for-purpose, general quality, and possible trade-offs within the parameters of the problem.	I5			
b15. Synthesize ideas, proposals and designs effectively using rational and reasoned	I6			

arguments for presentation to a range of audiences.			
b16. Generate the results of tests to investigate the functionality of computer systems.	I7		
b17. Reach computing judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact	I8		
b18. Read research papers in a range of knowledge areas	I9		

Academic Standards (Professional and Practical Skills)

IT Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
c1. Specify, investigate, analyze, design and develop computer-based systems using appropriate tools and techniques.		C1	P1. Operate computing equipment effectively, recognizing its logical and physical properties, capabilities and limitations.	C1. Specify, investigate, analyze, design and develop computer-based systems using appropriate tools and techniques.
c2. Evaluate systems in terms of their quality and possible trade-offs, evaluate appropriate hardware and software solutions for given scenarios.		C2	P2. Implement comprehensive computing knowledge and skills in projects and in deployment of computers to solve position practical problems.	C2. Evaluate systems in terms of their quality and possible trade-offs, evaluate appropriate hardware and software solutions for given scenarios.
c3. Recognize risks or safety aspects involved in the operation of computer-based systems.	P7	C3	P3. Deploy the equipment and tools used for the construction, maintenance and documentation of computer applications.	C3. Recognize risks or safety aspects involved in the operation of computer based systems.
c4. Effectively deploy tools for the implementation and documentation of computer-based systems.	P3	C4	P4. Apply computing information retrieval skills in computing community environment and industry.	C4. Deploy tools for the implementation and documentation of computer-based systems.
c5. Operate computing equipment efficiently, taking into account its logical and physical properties.	P1	C6	P5. Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material.	C5. Work as part of a development team and to recognize the different roles of its members.
c6. Recognize and address professional, moral and ethical issues within the discipline.		C7		C6. Operate computing equipment efficiently, taking into account its logical and physical properties.
c7. Show in-depth skills of appropriate aspects of Information Technology.		C8		C7. Recognize and address professional, moral and ethical issues within the discipline.
c8. Use investigative skills to research new and novel aspects of their work		C11		

c9. Make effective use of general IT facilities, plan and manage a project to complete within budget and schedule	P2		<p>P6. Design, implement, maintain, and manage software systems.</p> <p>P7. Assess the implications, risks or safety aspects involved in the operation of computing equipment within a specific context.</p> <p>P8. Handle a mass of diverse data, assess risk and draw conclusions.</p>	<p>C8. Effectively employ information-retrieval skills, (including the use of browsers, search engines, and on-line library catalogues), communicate effectively using a variety of communication methods, and communicate effectively with team members, managers and customers.</p> <p>C9. Make effective use of general IT facilities, plan and manage a project to complete within budget and schedule.</p> <p>C10. Manage one's own learning and development, including time management and organizational skills.</p> <p>C11. Present their work in the form of reports, oral presentations or an internet web site.</p>
c10. Recognize the need for continuing professional development in recognition of the need for lifelong learning.	P2			
c11. Apply tools and techniques for the design and development of applications and projects.	P2	A5		

Academic Standards (Transferable Skills)

IT Program ILOs	Corresponding in NARS	NARS ILOs – General	NARS ILOs – Special
d1. Collaborate effectively within multidisciplinary team.	T2	<p>T1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.</p> <p>T2. Demonstrate skills in group working, team management, time management and organizational skills.</p> <p>T3. Show the use of information-retrieval.</p> <p>T4. Use an appropriate mix of tools and aids in preparing and presenting reports for a range of audiences, including management, technical, users, industry or the academic community.</p> <p>T5. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.</p> <p>T6. Reveal communication skills, public speaking and presentation skills, and delegation, writing skills, oral delivery, and effectively using various media for a variety of audiences.</p> <p>T7. Show the use of general computing facilities.</p>	

			T8. Demonstrate an appreciation of the need to continue professional development in recognition of the requirement for life-long learning.	
d2. Work in stressful environment and within constraints.	T4			
d3. Communicate effectively.	T6			
d4. Demonstrate efficient IT capabilities.	T7			
d5. Lead and motivate individuals.	T2			
d6. Manage tasks and resources.	T2			
d7. Search for information and adopt life-long self-learning.				
d8. Work as part of a development team and to recognize the different roles of its members.	P6			
d9. Employ information-retrieval skills, (including the use of browsers, search engines, and on-line library catalogues), communicate effectively using a variety of communication methods, and communicate effectively with team members, managers and customers.	T2	C5		
d10. Work independently and as part of a team with minimum guidance.	T1 T3 T8	C9		
d11. Prepare their work in the form of reports, oral presentations or an internet web site.	P4	C10		
d12. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.	T1 T2			

Academic Standards Matrix

Knowledge and Understanding Skills			
NARS ILOs General	Covering ILOs in IT Program	NARS ILOs Special	Covering ILOs in IT Program
K1	a1, a2, a3, a4	A1	a1, a2, a13
K2	a5, a6, a7, a15	A2	a3, a4
K3	a11, a16	A3	a5, a6
K4	a1, a2	A4	a7
K5	a17	A5	a17, c11
K6	a10	A6	a8
K7	a9	A7	a9
K8	a14	A8	a10
		A9	a11
		A10	a12

Intellectual Skills			
NARS ILOs General	Covering ILOs in IT Program	NARS ILOs Special	Covering ILOs in IT Program
I1	b9	B1	b1
I2	b12	B2	b2
I3	b10	B3	b3
I4	b13	B4	b4
I5	b14	B5	b4
I6	b15	B6	b5
I7	b16	B7	b6
I8	b10, b17	B8	b7
I9	b11, b18	B9	b8
		B10	b9
		B11	b10

Professional and Practical Skills			
NARS ILOs General	Covering ILOs in IT Program	NARS ILOs Special	Covering ILOs in IT Program
P1	c5	C1	c1
P2	c9, c10, c11	C2	c2
P3	c4	C3	c3
P4	d11	C4	c4
P5	d7	C5	d9
P6	d8	C6	c5
P7	c3	C7	c6
		C8	c7
		C9	d10
		C10	d11
		C11	c8

Transferable skills			
NARS ILOs General	Covering ILOs in IT Program		
T1	d10, d12		
T2	d1, d5, d6, d9, d12		
T3	d10		
T4	d2		
T5	d14		
T6	d3, d7		
T7	d4		
T8	d10		

IT Program Courses

	Course Code	Course Title		Course Code	Course Title
1st Level	CS141	Programming Fundamentals	3rd Level	CS321	Operating Systems
	IT101	IT Fundamentals		CS351	Computer Graphics
	MATH101	Mathematics I		CS352	Image Processing
	MATH102	Mathematics II		CS381	Software Development and Professional Practice
	PHYS101	Physics I		CS391	Software Engineering
	PHYS102	Physics II		IT311	Network Security
	EE101	Electronics		IT331	Network Management
	EE102	Digital Circuits		IT351	Computer Networks
	HUM111	English Language I		IT361	Field Training
	HUM121	Social Context of Computing		IT371	Web Programming
	HUM132	Interpersonal Communication			
2nd Level	CS201	Discrete Structures	4th Level	IT431	Wireless and Mobile Computing
	CS211	Data Structures and Algorithms		IT451	Network Analysis and Design
	CS241	Object-Oriented Programming		IT441	Enterprise Architecture
	IS212	Databases		IT461	Capstone Project I
	IS221	Project Management		IT462	Capstone Project II
	IT251	Data Communications			
	CE221	Computer Architecture			
	MATH202	Probability and Statistics			
	HUM231	Business Administration			
	HUM232	Technical Writing			
	HUM241	Computers and Ethics			

Elective Courses					
	Course Code	Course Title		Course Code	Course Title
1st Level	HUM112	English Language II	3rd Level	CS301	Operation Research
	HUM122	Intellectual Property		CS302	Simulation and Modeling
	HUM131	Organizational Behavior		CS341	Visual Programming
	HUM133	Computing Economics		IS321	Advanced Project Management
	HUM142	Privacy and Civil Liberties		MM301	Introduction to Multimedia Technology
	HUM151	Hand Drawing		MATH301	Numerical Analysis
	HUM152	History of Computing			
	HUM153	Islamic Culture			
	HUM154	Scientific Thinking			
2nd Level	IS201	Foundations of Information Systems	4th Level	IT432	Network Programming
	IS211	File Organization		IT471	E-commerce
	IS231	Systems Analysis and Design		IT433	Network Forensics

Elective Courses					
	Course Code	Course Title		Course Code	Course Title
	MATH201	Mathematics III		IT452	Networked Embedded Systems
	EE201	Digital Signal Processing		CS451	Computer Animation
				CS431	Parallel Computation
				CS452	Computer Vision
				CS461	Intelligent Systems
				IS411	Advanced Database
				IS412	Distributed and Object Databases
				MM402	Virtual Reality
				CE421	Advanced Computer Architecture
				CE422	Embedded Systems

Program Matrix I (Courses - NARS General)

	Course	K1	K2	K3	K4	K5	K6	K7	K8	I1	I2	I3	I4	I5	I6	I7	I8	I9	P1	P2	P3	P4	P5	P6	P7	T1	T2	T3	T4	T5	T6	T7	T8	
1 st Level	CS141	✓	✓		✓			✓																	✓	✓	✓	✓	✓					
	IT101	✓	✓		✓			✓													✓					✓	✓	✓	✓	✓				
	MATH101	✓			✓																					✓								
	MATH102	✓	✓		✓																	✓				✓	✓							
	PHYS101	✓	✓		✓																✓	✓				✓	✓	✓	✓	✓	✓			
	PHYS102	✓	✓		✓																✓	✓				✓	✓	✓	✓	✓	✓			
	EE101	✓	✓		✓																✓	✓				✓	✓	✓	✓	✓	✓			
	EE102	✓	✓		✓																✓	✓				✓	✓	✓	✓	✓	✓			
	HUM111	✓			✓																					✓	✓	✓	✓	✓	✓			
	HUM112	✓			✓																					✓	✓	✓	✓	✓	✓			
	HUM121	✓			✓																				✓	✓	✓	✓	✓	✓	✓			
	HUM122	✓			✓																				✓	✓	✓	✓	✓	✓	✓			
	HUM131	✓			✓																					✓	✓	✓	✓	✓	✓			
	HUM132	✓			✓																				✓	✓	✓	✓	✓	✓	✓			
	HUM133	✓	✓		✓																					✓	✓	✓	✓	✓	✓			
	HUM141	✓	✓		✓																					✓	✓	✓	✓	✓	✓			
HUM142	✓	✓		✓																					✓	✓	✓	✓	✓					
HUM151	✓			✓																					✓	✓	✓	✓	✓					
HUM152	✓	✓		✓				✓														✓				✓	✓	✓	✓					
HUM153	✓			✓																					✓		✓	✓						
HUM154	✓			✓																					✓	✓	✓	✓						
2 nd Level	CS201	✓			✓																✓				✓	✓	✓	✓	✓					
	CS211	✓	✓		✓					✓		✓					✓	✓			✓	✓			✓	✓	✓	✓	✓	✓				
	CS241	✓	✓		✓																	✓			✓	✓	✓	✓	✓	✓				
	IS201	✓	✓		✓					✓		✓									✓	✓			✓	✓	✓	✓	✓	✓				
	IS211	✓	✓		✓				✓												✓	✓			✓	✓	✓	✓	✓	✓				
	IS212	✓	✓		✓																✓	✓			✓	✓	✓	✓	✓	✓				
	IS221	✓			✓																						✓	✓	✓					
	IS231	✓	✓		✓						✓		✓	✓	✓						✓	✓			✓	✓	✓	✓	✓	✓				
	IT251	✓	✓		✓																✓	✓			✓	✓	✓	✓	✓	✓				
	CE221	✓	✓		✓																					✓	✓	✓	✓	✓	✓			

	IT351	✓	✓	✓	✓		✓	✓	✓			
	IT361	✓	✓	✓	✓	✓	✓			✓	✓	
	IT371	✓	✓	✓	✓		✓					
	MM301	✓	✓	✓	✓	✓	✓	✓	✓			
	MATH301	✓	✓	✓	✓		✓	✓	✓			
4 th Level	IT431	✓	✓	✓	✓		✓					
	IT451	✓	✓	✓	✓		✓	✓	✓			
	IT432	✓	✓	✓	✓		✓					
	IT441	✓	✓	✓	✓		✓	✓				
	IT471	✓	✓	✓								
	IT433	✓	✓	✓	✓		✓	✓	✓			
	IT452	✓	✓	✓	✓		✓					
	IT461	✓	✓	✓	✓	✓	✓			✓	✓	
	IT462	✓	✓	✓	✓	✓	✓			✓	✓	
	CS451	✓	✓	✓	✓		✓	✓				
	CS431	✓	✓	✓	✓							
	CS452	✓	✓	✓								
	CS461	✓	✓	✓	✓							
	IS411	✓	✓									
	IS412	✓	✓									
	MM402	✓	✓	✓	✓		✓	✓				
	CE421	✓	✓	✓	✓		✓	✓				
CE422	✓	✓	✓	✓		✓						
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11

Program Matrix III (Courses - Knowledge and Understanding Skills)

	Code	Course	a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17
1st Level	CS141	Programming Fundamentals	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓				
	IT101	IT Fundamentals	✓	✓	✓	✓	✓	✓		✓	✓				✓				
	MATH101	Mathematics I	✓	✓												✓			
	MATH102	Mathematics II	✓	✓	✓	✓	✓									✓			
	PHYS101	Physics I	✓	✓	✓	✓	✓	✓								✓			
	PHYS102	Physics II	✓	✓	✓	✓	✓	✓	✓							✓			
	EE101	Electronics	✓	✓	✓	✓	✓									✓			
	EE102	Digital Circuits	✓	✓	✓	✓	✓	✓	✓	✓						✓			
	HUM111	English Language I	✓													✓			
	HUM112	English Language II	✓	✓												✓			
	HUM121	Social Context of Computing	✓	✓	✓											✓			
	HUM122	Intellectual Property	✓	✓												✓			
	HUM131	Organizational Behavior	✓	✓												✓			
	HUM132	Interpersonal Communication	✓	✓	✓											✓			
	HUM133	Computing Economics	✓	✓	✓	✓	✓	✓								✓			
	HUM141	Computer Law	✓	✓	✓	✓	✓									✓			
	HUM142	Privacy and Civil Liberties	✓	✓	✓	✓	✓									✓			
	HUM151	Hand Drawing	✓	✓	✓	✓										✓			
	HUM152	History of Computing		✓		✓	✓	✓				✓							
	HUM153	Islamic Culture	✓	✓	✓											✓			
HUM154	Scientific Thinking	✓	✓												✓				
2nd Level	CS201	Discrete Structures	✓	✓											✓				
	CS211	Data Structures and Algorithms	✓	✓	✓	✓	✓								✓				
	CS241	Object-Oriented Programming	✓	✓	✓	✓	✓								✓				
	IS201	Foundations of Information Systems	✓	✓	✓	✓	✓	✓	✓	✓					✓				
	IS211	File Organization	✓	✓	✓	✓		✓	✓	✓	✓				✓				
	IS212	Databases	✓	✓	✓	✓	✓	✓	✓						✓				
	IS221	Project Management	✓	✓											✓				
	IS231	Systems Analysis and Design	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓				
	IT251	Data Communications	✓	✓	✓	✓	✓	✓	✓						✓				
	CE221	Computer Architecture	✓	✓	✓	✓	✓	✓	✓	✓					✓				
	MATH201	Mathematics III	✓	✓	✓											✓			

	IT331	Network Management	✓	✓	✓	✓																
	IT351	Computer Networks	✓	✓	✓	✓	✓	✓	✓													
	IT361	Field Training	✓	✓	✓	✓	✓															
	IT371	Web Programming	✓	✓	✓	✓	✓															
	MM301	Introduction to Multimedia Technology	✓	✓	✓	✓	✓	✓	✓													
	MATH301	Numerical Analysis	✓	✓	✓	✓	✓	✓	✓													
4th Level	IT431	Wireless and Mobile Computing	✓	✓	✓	✓	✓															
	IT451	Network Analysis and Design	✓	✓	✓	✓	✓	✓	✓													
	IT432	Network Programming	✓	✓	✓	✓	✓															
	IT441	Enterprise Architecture	✓	✓	✓	✓	✓	✓														
	IT471	E-commerce	✓	✓	✓																	
	IT433	Network Forensics	✓	✓	✓	✓	✓	✓	✓	✓												
	IT452	Networked Embedded Systems	✓	✓	✓	✓	✓															
	IT461	Capstone Project I	✓	✓	✓	✓	✓															
	IT462	Capstone Project II	✓	✓	✓	✓	✓															
	CS451	Computer Animation	✓	✓	✓	✓	✓	✓														
	CS431	Parallel Computation	✓	✓	✓	✓																
	CS452	Computer Vision	✓	✓	✓																	
	CS461	Intelligent Systems	✓	✓	✓	✓																
	IS411	Advanced Database	✓	✓																		
	IS412	Distributed and Object Databases	✓	✓																		
	MM402	Virtual Reality	✓	✓	✓	✓	✓	✓														
	CE421	Advanced Computer Architecture	✓	✓	✓	✓	✓	✓														
	CE422	Embedded Systems	✓	✓	✓	✓	✓															
			c1	c2	c3	c4	c5	c6	c7	c8	c9	c10	C11									

Program Matrix VI (Courses - Transferable Skills)

	Code	Course	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12
1st Level	CS141	Programming Fundamentals	✓	✓	✓	✓	✓							
	IT101	IT Fundamentals	✓	✓	✓	✓								
	MATH101	Mathematics I	✓		✓									
	MATH102	Mathematics II	✓		✓									
	PHYS101	Physics I	✓	✓	✓	✓	✓	✓						
	PHYS102	Physics II	✓	✓	✓	✓	✓	✓						
	EE101	Electronics	✓	✓	✓	✓	✓	✓						

	Code	Course	a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17
1st Level	CS141	Programming Fundamentals	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓				
	IT101	IT Fundamentals	✓	✓	✓	✓	✓	✓		✓	✓				✓				
	MATH101	Mathematics I	✓	✓											✓				
	MATH102	Mathematics II	✓	✓	✓	✓	✓								✓				
	PHYS101	Physics I	✓	✓	✓	✓	✓	✓							✓				
	PHYS102	Physics II	✓	✓	✓	✓	✓	✓	✓						✓				
	EE101	Electronics	✓	✓	✓	✓	✓								✓				
	EE102	Digital Circuits	✓	✓	✓	✓	✓	✓	✓	✓					✓				
	HUM111	English Language I	✓													✓			
	HUM112	English Language II	✓	✓												✓			
	HUM121	Social Context of Computing	✓	✓	✓											✓			
	HUM122	Intellectual Property	✓	✓												✓			
	HUM131	Organizational Behavior	✓	✓												✓			
	HUM132	Interpersonal Communication	✓	✓	✓											✓			
	HUM133	Computing Economics	✓	✓	✓	✓	✓	✓								✓			
	HUM141	Computer Law	✓	✓	✓	✓	✓									✓			
	HUM142	Privacy and Civil Liberties	✓	✓	✓	✓	✓									✓			
	HUM151	Hand Drawing	✓	✓	✓	✓										✓			
	HUM152	History of Computing		✓		✓	✓	✓				✓							
	HUM153	Islamic Culture	✓	✓	✓											✓			
HUM154	Scientific Thinking	✓	✓												✓				
2nd Level	CS201	Discrete Structures	✓	✓											✓				
	CS211	Data Structures and Algorithms	✓	✓	✓	✓	✓								✓				
	CS241	Object-Oriented Programming	✓	✓	✓	✓	✓								✓				
	IS201	Foundations of Information Systems	✓	✓	✓	✓	✓	✓	✓	✓					✓				
	IS211	File Organization	✓	✓	✓	✓		✓	✓	✓	✓				✓				
	IS212	Databases	✓	✓	✓	✓	✓	✓	✓						✓				
	IS221	Project Management	✓	✓											✓				
	IS231	Systems Analysis and Design	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓				
	IT251	Data Communications	✓	✓	✓	✓	✓	✓	✓						✓				
	CE221	Computer Architecture	✓	✓	✓	✓	✓	✓	✓	✓					✓				
	MATH201	Mathematics III	✓	✓	✓										✓				

	HUM154	Scientific Thinking	✓																	
2 nd Level	CS201	Discrete Structures																		
	CS211	Data Structures and Algorithms																		
	CS241	Object-Oriented Programming																		
	IS201	Foundations of Information Systems	✓	✓	✓	✓	✓	✓	✓											
	IS211	File Organization	✓	✓	✓	✓	✓	✓												
	IS212	Databases																		
	IS221	Project Management																		
	IS231	Systems Analysis and Design	✓	✓	✓	✓	✓													
	IT251	Data Communications	✓	✓	✓	✓	✓													
	CE221	Computer Architecture	✓	✓	✓															
	MATH201	Mathematics III	✓				✓													
	MATH202	Probability and Statistics	✓	✓	✓	✓														
	EE201	Digital Signal Processing	✓				✓													
	HUM231	Business Administration																		
	HUM232	Technical Writing																		
HUM241	Computers and Ethics																			
3 rd Level	CS301	Operation Research	✓	✓																
	CS302	Simulation and Modeling	✓	✓																
	CS321	Operating Systems																		
	CS341	Visual Programming	✓	✓	✓	✓	✓													
	CS351	Computer Graphics																		
	CS352	Image Processing																		
	CS381	Software Development and Professional Practice																		
	CS391	Software Engineering																		
	IS321	Advanced Project Management	✓																	
	IT311	Network Security	✓	✓	✓	✓	✓	✓	✓	✓										
	IT331	Network Management	✓	✓	✓	✓														
	IT351	Computer Networks	✓	✓	✓	✓	✓	✓	✓	✓										
	IT361	Field Training	✓	✓	✓	✓	✓													
	IT371	Web Programming	✓	✓	✓	✓	✓													
	MM301	Introduction to Multimedia Technology	✓	✓	✓	✓	✓	✓	✓	✓										
MATH301	Numerical Analysis	✓	✓	✓	✓	✓	✓	✓	✓											
4 th level	IT431	Wireless and Mobile Computing	✓	✓	✓	✓	✓													

IT451	Network Analysis and Design	✓	✓	✓	✓	✓	✓	✓												
IT432	Network Programming	✓	✓	✓	✓	✓														
IT441	Enterprise Architecture	✓	✓	✓	✓	✓	✓													
IT471	E-commerce	✓	✓	✓																
IT433	Network Forensics	✓	✓	✓	✓	✓	✓	✓												
IT452	Networked Embedded Systems	✓	✓	✓	✓	✓														
IT461	Capstone Project I	✓	✓	✓	✓	✓														
IT462	Capstone Project II	✓	✓	✓	✓	✓														
CS451	Computer Animation	✓	✓	✓	✓	✓	✓													
CS431	Parallel Computation	✓	✓	✓	✓															
CS452	Computer Vision	✓	✓	✓																
CS461	Intelligent Systems	✓	✓	✓	✓															
IS411	Advanced Database	✓	✓																	
IS412	Distributed and Object Databases	✓	✓																	
MM402	Virtual Reality	✓	✓	✓	✓	✓	✓													
CE421	Advanced Computer Architecture	✓	✓	✓	✓	✓	✓													
CE422	Embedded Systems	✓	✓	✓	✓	✓														
		c1	c2	c3	c4	c5	c6	c7	c8	c9	c10	C11								

	Code	Course	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12	
1st Level	CS141	Programming Fundamentals													
	IT101	IT Fundamentals	✓	✓	✓	✓									
	MATH101	Mathematics I	✓		✓										
	MATH102	Mathematics II	✓		✓										
	PHYS101	Physics I	✓	✓	✓	✓	✓	✓							
	PHYS102	Physics II	✓	✓	✓	✓	✓	✓							
	EE101	Electronics	✓	✓	✓	✓	✓	✓							
	EE102	Digital Circuits	✓	✓	✓	✓	✓								
	HUM111	English Language I													
	HUM112	English Language II	✓	✓	✓	✓	✓	✓	✓	✓					
	HUM121	Social Context of Computing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
	HUM122	Intellectual Property													
	HUM131	Organizational Behavior	✓	✓	✓	✓	✓	✓	✓	✓					
	HUM132	Interpersonal Communication													
	HUM133	Computing Economics	✓	✓	✓	✓	✓	✓							

	HUM141	Computer Law	✓	✓	✓	✓														
	HUM142	Privacy and Civil Liberties	✓	✓	✓															
	HUM151	Hand Drawing	✓	✓	✓															
	HUM152	History of Computing	✓	✓	✓															
	HUM153	Islamic Culture		✓	✓															
	HUM154	Scientific Thinking	✓	✓	✓															
2nd Level	CS201	Discrete Structures																		
	CS211	Data Structures and Algorithms																		
	CS241	Object-Oriented Programming																		
	IS201	Foundations of Information Systems			✓	✓	✓	✓												
	IS211	File Organization	✓	✓	✓	✓	✓	✓												
	IS212	Databases																		
	IS221	Project Management																		
	IS231	Systems Analysis and Design	✓	✓	✓	✓	✓	✓	✓	✓										
	IT251	Data Communications	✓	✓	✓	✓	✓	✓												
	CE221	Computer Architecture	✓	✓	✓	✓														
	MATH201	Mathematics III	✓	✓	✓	✓	✓													
	MATH202	Probability and Statistics	✓	✓	✓	✓	✓	✓												
	EE201	Digital Signal Processing	✓	✓	✓	✓	✓													
	HUM231	Business Administration																		
	HUM232	Technical Writing																		
HUM241	Computers and Ethics																			
3rd Level	CS301	Operation Research																		
	CS302	Simulation and Modeling	✓		✓															
	CS321	Operating Systems																		
	CS341	Visual Programming	✓	✓	✓	✓	✓	✓												
	CS351	Computer Graphics																		
	CS352	Image Processing																		
	CS381	Software Development and Professional Practice																		
	CS391	Software Engineering																		
	IS321	Advanced Project Management	✓																	
	IT311	Network Security	✓	✓	✓	✓	✓	✓												
	IT331	Network Management	✓	✓	✓	✓	✓	✓												
	IT351	Computer Networks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						

Intended Learning Outcomes (ILO's) of the program		Teaching and Learning Methods						
		Lecture	Tutorials exercises	Practical exercises	Workshops	Projects	Case study	Data collection
Knowledge and Understanding	a.1) Demonstrate basic knowledge and understanding of fundamental principles of computer architectures and operating systems and how these support IT-based applications.	✓	✓				✓	✓
	a.2) Demonstrate basic knowledge and understanding of fundamental principles of computer communications and networks, and distributed computing and how these support IT-based applications.	✓	✓	✓		✓	✓	✓
	a.3) Demonstrate strong knowledge of fundamentals of programming and the construction of data structures and algorithms.	✓	✓	✓		✓		
	a.4) Demonstrate strong knowledge of fundamentals of programming and the construction of computer-based systems, software engineering techniques and information retrieval.	✓	✓	✓		✓		
	a.5) Show a critical understanding of the theory and methods of systems analysis and design.	✓	✓				✓	
	a.6) Show a critical understanding of technologies for the design, development and management of multi-user database systems and the implementation of database systems and information retrieval systems.	✓	✓	✓		✓	✓	✓
	a.7) Have a comprehensive knowledge and critical awareness of the role of human factors in the design of Information Technology systems, issues of human-computer interaction, graphics and sound and multi-media theory and applications, interfacing and cognition.	✓	✓	✓		✓	✓	
	a.8) Know methods for the construction of web-based systems, design of internet-based systems.	✓	✓			✓	✓	
	a.9) Provide a deeper understanding of legal, professional and moral aspects of the exploitation of IT.	✓			✓		✓	✓
	a.10) Show a critical understanding of the broad context within computer information technology such as quality, reliability, enterprise, employment law, accounting, business and management and health.	✓			✓		✓	✓
	a.11) Show a critical understanding of the challenges inherent in the maintenance and evolution of IT-based systems, and the techniques and best practices currently available for dealing with them.	✓	✓	✓		✓	✓	

Intended Learning Outcomes (ILO's) of the program		Teaching and Learning Methods						
		Lecture	Tutorials exercises	Practical exercises	Workshops	Projects	Case study	Data collection
	a.12) Provide a deeper understanding of some aspects of the subject, such as image processing, computer and communication network, data mining and knowledge discovery, information storage and retrieval systems, mobile Communication Systems, pattern recognition, digital signal processing, speech recognition, artificial Intelligence, cryptography and network security, network programming and web services.	✓	✓	✓		✓	✓	✓
	a.13) Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.	✓	✓					
	a.14) Know the principles and techniques of a number of application areas informed by the research directions of IT areas.	✓		✓	✓		✓	
	a.15) Describe the tools, practices and methodologies used in the specification, design, implementation and critical evaluation of computer software systems.	✓	✓	✓		✓	✓	
	a.16) Describe the methods used in defining and assessing criteria for measuring the extent to which a computer system is appropriate for its current deployment and future evolution.	✓	✓					✓
	a.17) Know the principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.	✓	✓	✓		✓	✓	
Intellectual Skills	b.1) Define traditional and nontraditional information technology systems problems, set goals towards solving them, observe results, reason and apply judgment.		✓	✓			✓	
	b.2) Identify attributes, components, relationships, patterns, main ideas, and errors.		✓				✓	
	b.3) Summarize the proposed solutions ad their results.			✓		✓		
	b.4) Restrict solution methodologies upon their results.			✓		✓		
	b.5) Establish criteria, and verify solutions.			✓		✓	✓	
	b.6) Identify a range of solutions and critically evaluate and justify proposed design solutions.		✓	✓				
	b.7) Solve information technology problems with pressing commercial or industrial constraints.			✓		✓	✓	
	b.8) Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.			✓		✓		
	b.9) Perform problem analysis from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis).		✓	✓		✓	✓	
	b.10) Create and/or justify designs to satisfy given requirements (synthesis, evaluation, application).			✓			✓	✓

Intended Learning Outcomes (ILO's) of the program		Teaching and Learning Methods						
		Lecture	Tutorials exercises	Practical exercises	Workshops	Projects	Case study	Data collection
	b.11) Recognize the professional, moral and ethical issues involved in the exploitation of Information Technology and be guided by their adoption, reflect on issues of professional practice within the discipline.	✓			✓		✓	
	b.12) Apply the concepts, principles, theories and practices underpinning computing as an academic discipline.		✓	✓	✓		✓	
	b.13) Define criteria to measure the appropriateness of a computer system for its current deployment and future evolution, and to interpret the results thereof.		✓	✓		✓		
	b.14) Analyze alternative computer systems and processes taking into account limitations, constraints, fit-for-purpose, general quality, and possible trade-offs within the parameters of the problem.	✓	✓				✓	
	b.15) Synthesize ideas, proposals and designs effectively using rational and reasoned arguments for presentation to a range of audiences.		✓	✓		✓		
	b.16) Generate the results of tests to investigate the functionality of computer systems.			✓	✓	✓	✓	
	b.17) Reach computing judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact.	✓	✓		✓		✓	
	b.18) Read research papers in a range of knowledge areas.	✓	✓		✓			✓
Professional Skills	c.1) Specify, investigate, analyze, design and develop computer-based systems using appropriate tools and techniques.	✓	✓	✓		✓	✓	
	c.2) Evaluate systems in terms of their quality and possible trade-offs, evaluate appropriate hardware and software solutions for given scenarios.	✓	✓		✓			✓
	c.3) Recognize risks or safety aspects involved in the operation of computer-based systems.	✓	✓				✓	
	c.4) Effectively deploy tools for the implementation and documentation of computer-based systems.	✓	✓	✓				
	c.5) Operate computing equipment efficiently, taking into account its logical and physical properties.		✓	✓		✓		
	c.6) Recognize and address professional, moral and ethical issues within the discipline.	✓	✓		✓			
	c.7) Show an in-depth knowledge of appropriate aspects of Information Technology.	✓	✓		✓		✓	
	c.8) Use investigative skills to research new and novel aspects of their work	✓			✓			✓
	c.9) Make effective use of general IT facilities, plan and manage a project to complete within budget and schedule		✓		✓			✓

Intended Learning Outcomes (ILO's) of the program		Teaching and Learning Methods						
		Lecture	Tutorials exercises	Practical exercises	Workshops	Projects	Case study	Data collection
	c.10) Recognize the need for continuing professional development in recognition of the need for lifelong learning.	✓			✓			✓
	c.11) Apply tools and techniques for the design and development of applications and projects.		✓	✓		✓		✓
General Skills	d.1) Collaborate effectively within multidisciplinary team.		✓			✓		
	d.2) Work in stressful environment and within constraints.			✓		✓		
	d.3) Communicate effectively.		✓	✓				
	d.4) Demonstrate efficient IT capabilities.		✓	✓	✓	✓		
	d.5) Lead and motivate individuals.		✓			✓		
	d.6) Manage tasks and resources.		✓	✓		✓		
	d.7) Search for information and adopt life-long self-learning.		✓	✓		✓		✓
	d.8) Work as part of a development team and to recognize the different roles of its members.			✓	✓	✓		
	d.9) Employ information-retrieval skills, (including the use of browsers, search engines, and on-line library catalogues), communicate effectively using a variety of communication methods, and communicate effectively with team members, managers and customers.		✓	✓		✓		✓
	d.10) Work independently and as part of a team with minimum guidance.			✓	✓	✓		
	d.11) Prepare their work in the form of reports, oral presentations or an internet web site.		✓	✓		✓		
	d.12) Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.		✓	✓				

2- ASSESMENT METHODS

Intended Learning Outcomes (ILO's) of the program		Assessment methods				
		Final Exam	Mid-Term Exam	Practical Exam	Class Work	Oral Exam
Kn owl	a.1) Demonstrate basic knowledge and understanding of fundamental principles of computer architectures and operating systems and how these support IT-based applications.	✓	✓		✓	

Intended Learning Outcomes (ILO's) of the program	Assessment methods				
	Final Exam	Mid-Term Exam	Practical Exam	Class Work	Oral Exam
a.2) Demonstrate basic knowledge and understanding of fundamental principles of computer communications and networks, and distributed computing and how these support IT-based applications.	✓	✓	✓	✓	
a.3) Demonstrate strong knowledge of fundamentals of programming and the construction of data structures and algorithms.	✓	✓	✓	✓	
a.4) Demonstrate strong knowledge of fundamentals of programming and the construction of computer-based systems, software engineering techniques and information retrieval.	✓	✓	✓	✓	
a.5) Show a critical understanding of the theory and methods of systems analysis and design.	✓	✓		✓	
a.6) Show a critical understanding of technologies for the design, development and management of multi-user database systems and the implementation of database systems and information retrieval systems.	✓	✓	✓	✓	
a.7) Have a comprehensive knowledge and critical awareness of the role of human factors in the design of Information Technology systems, issues of human-computer interaction, graphics and sound and multi-media theory and applications, interfacing and cognition.	✓	✓	✓	✓	
a.8) Know methods for the construction of web-based systems, design of internet-based systems.	✓	✓	✓	✓	
a.9) Provide a deeper understanding of legal, professional and moral aspects of the exploitation of IT.	✓	✓		✓	
a.10) Show a critical understanding of the broad context within computer information technology such as quality, reliability, enterprise, employment law, accounting, business and management and health.	✓	✓		✓	
a.11) Show a critical understanding of the challenges inherent in the maintenance and evolution of IT-based systems, and the techniques and best practices currently available for dealing with them.	✓	✓	✓	✓	
a.12) Provide a deeper understanding of some aspects of the subject, such as image processing, computer and communication network, data mining and knowledge discovery, information storage and retrieval systems, mobile Communication Systems, pattern recognition, digital signal processing, speech recognition, artificial Intelligence, cryptography and network security, network programming and web services.	✓	✓	✓	✓	
a.13) Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.	✓	✓		✓	
a.14) Know the principles and techniques of a number of application areas informed by the research directions of IT areas.	✓	✓		✓	
a.15) Describe the tools, practices and methodologies used in the specification, design, implementation and critical evaluation of computer software systems.	✓	✓	✓	✓	
a.16) Describe the methods used in defining and assessing criteria for measuring the extent to which a computer system is appropriate for its current deployment and future evolution.	✓	✓	✓	✓	
a.17) Know the principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.	✓	✓	✓	✓	

Intended Learning Outcomes (ILO's) of the program		Assessment methods				
		Final Exam	Mid-Term Exam	Practical Exam	Class Work	Oral Exam
Intellectual Skills	b.1) Define traditional and nontraditional information technology systems problems, set goals towards solving them, observe results, reason and apply judgment.	✓	✓		✓	
	b.2) Identify attributes, components, relationships, patterns, main ideas, and errors.	✓	✓		✓	
	b.3) Summarize the proposed solutions and their results.	✓	✓		✓	
	b.4) Restrict solution methodologies upon their results.	✓	✓		✓	
	b.5) Establish criteria, and verify solutions.	✓	✓		✓	
	b.6) Identify a range of solutions and critically evaluate and justify proposed design solutions.	✓	✓		✓	
	b.7) Solve information technology problems with pressing commercial or industrial constraints.	✓	✓		✓	
	b.8) Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.	✓	✓		✓	
	b.9) Perform problem analysis from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis).	✓	✓		✓	
	b.10) Create and/or justify designs to satisfy given requirements (synthesis, evaluation, application).	✓	✓	✓	✓	
	b.11) Recognize the professional, moral and ethical issues involved in the exploitation of Information Technology and be guided by their adoption, reflect on issues of professional practice within the discipline.	✓	✓	✓	✓	
	b.12) Apply the concepts, principles, theories and practices underpinning computing as an academic discipline.	✓	✓		✓	
	b.13) Define criteria to measure the appropriateness of a computer system for its current deployment and future evolution, and to interpret the results thereof.	✓	✓		✓	
	b.14) Analyze alternative computer systems and processes taking into account limitations, constraints, fit-for-purpose, general quality, and possible trade-offs within the parameters of the problem.	✓	✓		✓	
	b.15) Synthesize ideas, proposals and designs effectively using rational and reasoned arguments for presentation to a range of audiences.				✓	
	b.16) Generate and evaluate the results of tests to investigate the functionality of computer systems.	✓	✓	✓	✓	
	b.17) Reach computing judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact.	✓	✓		✓	
	b.18) Read research papers in a range of knowledge areas.				✓	
Professional Skills	c.1) Specify, investigate, analyze, design and develop computer-based systems using appropriate tools and techniques.	✓	✓	✓	✓	
	c.2) Evaluate systems in terms of their quality and possible trade-offs, evaluate appropriate hardware and software solutions for given scenarios.	✓	✓		✓	
	c.3) Recognize risks or safety aspects involved in the operation of computer-based systems.	✓	✓		✓	
	c.4) Effectively deploy tools for the implementation and documentation of computer-based systems.			✓	✓	
	c.5) Operate computing equipment efficiently, taking into account its logical and physical properties.			✓	✓	

Intended Learning Outcomes (ILO's) of the program		Assessment methods				
		Final Exam	Mid-Term Exam	Practical Exam	Class Work	Oral Exam
	c.6) Recognize and address professional, moral and ethical issues within the discipline.	✓	✓		✓	
	c.7) Show an in-depth knowledge of appropriate aspects of Information Technology.	✓	✓		✓	
	c.8) Use investigative skills to research new and novel aspects of their work	✓	✓		✓	
	c.9) Make effective use of general IT facilities, plan and manage a project to complete within budget and schedule	✓	✓		✓	
	c.10) Recognize the need for continuing professional development in recognition of the need for lifelong learning.				✓	
	c.11) Apply tools and techniques for the design and development of applications and projects.	✓	✓	✓	✓	
General Skills	d.1) Collaborate effectively within multidisciplinary team.		✓	✓	✓	
	d.2) Work in stressful environment and within constraints.			✓	✓	
	d.3) Communicate effectively.			✓	✓	
	d.4) Demonstrate efficient IT capabilities.			✓	✓	
	d.5) Lead and motivate individuals.			✓	✓	
	d.6) Manage tasks and resources.		✓		✓	
	d.7) Search for information and adopt life-long self-learning.	✓	✓	✓	✓	✓
	d.8) Work as part of a development team and to recognize the different roles of its members.			✓	✓	
	d.9) Employ information-retrieval skills, (including the use of browsers, search engines, and on-line library catalogues), communicate effectively using a variety of communication methods, and communicate effectively with team members, managers and customers.			✓	✓	
	d.10) Work independently and as part of a team with minimum guidance.			✓	✓	
	d.11) Prepare their work in the form of reports, oral presentations or an internet web site.	✓	✓	✓	✓	
	d.12) Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.	✓	✓		✓	

Program Coordinator: Prof. Hosny M. Ibrahim

Signature:

Approved by the Dean: Prof. Adel A. swisy

Signature:

