# **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



# Assiut University Faculty of Computers & Information Quality Assurance Unit



# IT Program

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#### Assiut University

# Faculty of Computers & Information

Quality Assurance Unit



# 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 ad 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 computerbased 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.

ч	Subject Area	Credit Hours	Credit %	Tolerance %
rar	Humanities and social sciences	18	12.5%	8-10%
rog	(Univ. Req.)			
Components of the Program	Mathematics and basic sciences	28	19.44%	16-18%
th	Basic computing sciences	42	29.17%	26-28%
o to	(Faculty/Spec. Req.)			
suts	Applied and of specialized	42	29.17%	28-30%
one	computing sciences			
du	Projects and practice	14	9.72%	6-10%
Coī	Total	144	100 %	84-96%
<del>_</del> i	Optional (Institution character-	15	N/A	16-4%
Table	identifying subjects)			
Tal	Total	N/A	N/A	100%

#### 6. Program Courses

6a. First Year of IT Program

	Code/	Course Title	Prerequisites		No. of /weel		3	Achieved (NARS)
	course No.	Course Title	•	Credits	Lect.	Lab	Exer.	ILOs
	CS141	Programming Fundamentals	IT101	3	3	3	-	a1,a2,a3,a4,a5-a9, a13,b1-b5,c1-c3,d1-d5
urs)	IT101	IT Fundamentals	-	3	3	3	-	a1-a6,a8,a9, a13,b1- b3,c1-c4,d1-d4
redit ho	MATH101	Mathematics I	-	3	3	-	2	a1,a2, a13,b1-b6,c1- c3,d1,d3
ses (28 c	MATH102	Mathematics II	MATH101	3	3	-	2	a1-a5, a13,b1-b6,c1- c4,d1,d3
ry Cours	PHYS101	PHYS101 Physics I		3	2	2	-	a1-a6, a13,b1-b4,c1- c6,d1-d6
osludu	PHYS102	Physics II	-	3	2	2	-	a1-a7, a13,b1-b4,c1- c5,d1-d6
Table 2. a) Compulsory Courses (28 credit hours)	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	Course Title	Prerequisites	Credits	No. of	f hours k	5	Achieved
	No.	Course little		Credits	Lect.	Lab	Exer.	(NARS) ILOs
urs)	HUM112	English Language II	HUM111	2	2	-	-	a1,a2, a13,b1-b3,c1- c3, d1-d7
edit hoı	HUM122	Intellectual Property	-	1	1	-	-	a1,a2, a13,b1-b3,c1- c3,d1-d7
Table 3. b) Elective Courses (choose only 8 credit hours)	HUM131	Organizational Behavior	-	2	2	-	-	a1,a2, a13,b1-b3,c1- c3,d1-d7
hoose c	HUM133	Computing Economics	-	2	2	-	-	a1-a6, a13,b1,b2,c1- c3,d1-d7
urses (c	HUM141	Computer Law	-	2	2	-	-	a1-a5, a13,b1- b5,c1,c3,d1-d4
ctive Co	HUM142	Privacy and Civil Liberties	-	1	1	-	-	a1-a5, a13,b1- b4,c2,c3,d1-d3
. b) Elec	HUM151	Hand Drawing	-	2	1	3	-	a1-a4, a13,b1,b4,c1- c3,d1-d3
Table 3	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

					No. of	hours	/week	
	Code/ course No.	Course Title Prerequisites		Credits	Lect.	Lab	Exer.	Achieved (NARS) ILOs
	CS201	Discrete Structures	MATH102	3	3	-	2	a1,a2, a13,b1-b6,c1-c4,d1-d4
it hours	CS211	Data Structures and Algorithms	CS241	3	3	2	-	a1-a5, a13,b1-b11,b18,c1-c7,d1- d6
(27 cred	CS241	Object Oriented Programming	CS241	3	3	2	-	a1-a5, a13,b1,b2-b5,c1-c4,d1- d6
Table 4. a) Compulsory Courses (27 credit hours)	IS212	Databases	IS201	3	3	2	-	a1-a7, a13,b1-b5,c1-c6,d1,d3- d6
lsory (	IS221	Project Management	IT101	2	2	-	2	a1,a2, a13,b1,c1,d2-d6
ndwo	IT251	Data Communications	IT101	3	3	-	2	a1-a7, a13,b1-b6,c1-c5,d1-d6
e 4. a) C	CE221	Computer Architecture	CS141, CS201	3	3	2	1	a1-a8, a13,b1-b4,c1-c3,d1-d4
Table	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

		C T'II	Prerequisites	C 1"	No. of /weel		5	Achieved
	Code/ course No.	Course Title		Credits	Lect.	Lab	Exer.	(NARS) ILOs
12 credit hours)	IS201	Foundations of Information Systems	IT101	3	3	2	-	a1-a8, a13,b1- b10,c1- c6,c8,d1,d3- d7
e only from 0 to	IS211	File Organization	CS241	3	3	2	-	a1-a4,a6-a9, a13,b1- b4,c1- c6,d1-d6
Table 5. b) Elective Courses (choose only from 0 to 12 credit hours)	IS231	Systems Analysis and Design	IT101	3	3	-	2	a1-a8, a13,b1- b8,b11- b15,b18,c1- c5,d1-d8
able 5. b) Electi	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

6c. Third year of IT Program

	Code/ Prerequisites				No. of /weel	hours	5	
	No.	Course Title		Credits	Lect.	Lab	Exer.	Achieved (NARS) ILOs
hours	CS321	Operating Systems	CE221	3	3	2	-	a1-a8, a13,b1-b5,c1-c5,d1,d2
redit	CS351	Computer Graphics	IT101, CS201	3	3	2	-	a1-a7, a13,b1-b6,c1-c4,d1-d6
s (30 c	CS352	Image Processing	CS211	3	3	2	-	a1-a8, a13,b1-b6,c1-c5,d1-d6
ory Courses (30 credit hours)	CS381	Software Development and Professional Practice	CS211, CS391	3	3	2	-	a1-a10, a13,b1-b15,c1-c6,d1-d6
Compulsory	CS391	Software Engineering	IS231	3	3	-	2	a1-a10, a13,b1-b15,c1-c6,d1-d6
Col	IT311	Network Security	IT351	3	3	-	2	a1-a8, a13,b1-b9,c1-c7,d1-d6
Table 6. a)	IT331	Network Management	IT351	3	2	3	-	a1-a7, a13,a17,b1,b2,b4,c1-c4,d1-d6
Table	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

			Duama mailaitaa		No. of	f hours	/week	Achieved	
urs)	Code/ course No. Course Title		Prerequisites	Credits	Lect.	Lab	Exer.	(NARS) ILOs	
it ho	CS301		CS201					a1,a3-a6, a13,b1-	
Table 7. b) Elective Courses (choose only from 0 to 15 credit hours)		Operation Research		3	3	2	-	b3,c1,c2	
0 to	CS302	Simulation and	MATH202	_	_	_		a1-a4, a13,b1-	
rom		Modeling		3	3	2	-	b4,c1,c2,d1,d3	
nly 1	CS341		CS211					a1-a6, a13,b1-	
se o		Visual Programming		3	3	2	-	b5,c1-c5,d1- d6	
choc									
ses (	IS321	Advanced Project	IS221	3	3		2	a1,a2, a13,b1,c1,d1	
our		Management		3	3			a13,01,C1,d1	
ve (	MM301		CS241					a1, a2,a3,	
lecti		Introduction to Multimedia		3	3	2		a13,b1-	
b) E		Technology		3	3	2	-	b4,c1,c2, c3-	
e 7.		O,						c7 , d1-d9	
Tabl	MATH301		MATH102					a1-a3, a13,b1-	
		Numerical Analysis		3	3	_	2	b6,c1-c7,d1- d7	
								u/	

6d. Fourth year of IT Program

	s)	Code/ course Course Title Prerequisites Credits		G 11:	No. of hours /week			Achieved (NARS)	
	it hour				Credits	Lect.	Lab	Exer.	ILOs
	(15 credit hours)	IT431	Wireless and Mobile Computing	IT251	3	3	2	ı	a1-a4,a7-a9, a13,b1-b6,c1- c5,d1-d7
Courses	IT451	Network Analysis and Design	IT351, MATH202	3	3	2	-	a1-a10, a13,b1- b13,c1-c7,d1-d7	
	8. a) Compulsory Courses	IT441	Enterprise Architecture	IT351	3	3	ı	2	a1-a6, a13,b1- b5,c1-c6,d1-d5
		IT461	Project I	CS381, IS221	3	1	4	ı	a1-a9, a13,b1- b16,c1-c5,d1-d11
	Table	IT462	Project II	CS381, IS221	3	1	4	_	a1-a9, a13,b1- b16,c1-c5,d1-d11

	Code/ course	G FW	Prerequisites	G 111	No. of /weel		3	Achieved
	No.	Course Title		Credits	Lect.	Lab	Exer.	(NARS) ILOs
	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
hours)	IT433	Network Forensics	IT351	3	3	-	2	a1-a17, a13,b1- b7,c1-c7,d1-d4
Table 9. b) Elective Courses (choose only from 21 to 24 credit hours)	IT452	Networked Embedded Systems	IT351, CE422	3	3	-	2	a1-a7, a13,b1- b5,c1-c5,d1-d6
om 21 to	CS451	Computer Animation	CS352	3	3	2	-	a1-a5, a13,b1- b3,c1-c6,d1-d4
e only fro	CS431	Parallel Computation	CS311, CS321	3	3	2	-	a1-a9, a13,b1- b5,c1-c4,d1-d4
se (choose	CS452	Computer Vision	CS241, PHYS102	3	3	2	-	a1-a3, a13,b1- b4,c1-c3,d1-d5
7e Course	CS461	Intelligent Systems	CS361	3	3	-	2	a1-a4, a13,b1- b3,c1-c4,d1-d4
b) Electiv	IS411	Advanced Database	IS212	3	3	-	2	a1-a3, a13,b1- b6,c1,c2,d1-d6
Table 9.	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

	nent s for nt)	1- Written examinations	Knowledge and Understanding - Intellectual Skills - Professional Skills - General Skills
10.	Assessmeni and rules for ssessment)	2- Oral examination	Knowledge and Understanding - Intellectual Skills
Fable	Table 1 9. Student Ass (Methods and student asses	3- Laboratory examination	Professional Skills - General Skills
		4- Graduation project	Professional Skills - General Skills
	6. €.	5- Reports and homework	Knowledge and Understanding

## 11. Program Evaluation

	u	Evaluator	Tool	Sample
	ograr tion	1- Senior students	Questionnaires	
5 11		2- Alumni	Questionnaires	
able	Pro alua	3- Stakeholders (Employers)	Questionnaires, Joint	
T	). 9. Eva	, 1 ,	Discussion	
	10	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 VIIII (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	Corresp in N.		NARS ILOs - General	NARS ILOs - Special
a1. Demonstrate basic knowledge and	A1	K1,	K1.Essential facts, concepts, principles	A1. Demonstrate basic knowledge and understanding
understanding of fundamental principles		K4	and theories relating to computing and	of fundamental principles of core computing.
of computer architectures and operating			information and computer applications as	
systems and how these support IT-based			appropriate to the program of study.	A2. Demonstrate strong knowledge of fundamentals
applications.				of programming and the construction of computer-
a2. Demonstrate basic knowledge and	A1	K1,	K2. Modeling and design of computer-	based systems, data structures and algorithms,
understanding of fundamental principles		K4	based systems bearing in mind the trade-	software engineering techniques and information
of computer communications and			offs.	retrieval.
networks, and distributed computing and			170 T 1 1 .1 .1 .1	40 D 11 1 1 1 6
how these support IT-based applications.	1.0	174	K3.Tools, practices and methodologies	A3. Provide a deeper understanding of some aspects
a3. Demonstrate strong knowledge of	A2	K1	used in the specification, design,	of the subject, such as multimedia, computer and
fundamentals of programming and the			implementation and evaluation of	communication network, data mining and knowledge
construction of data structures and			computer software systems.	discovery, information storage and retrieval systems, mobile Communication Systems, pattern recognition,
algorithms.	A2	K1	VA Criteria and anapiliasticus annuanists	artificial Intelligence, cryptography and network
a4. Demonstrate strong knowledge of	AZ	K1	K4.Criteria and specifications appropriate to specific problems, and plan strategies	security.
fundamentals of programming and the construction of computer-based systems,			for their solution.	security.
software engineering techniques and			for their solution.	A4. Show the understanding of technologies for the
information retrieval.			K5.The extent to which a computer-	design, development and management of database
a5. Show a critical understanding of the	A3	K2	based system meets the criteria defined	systems, systems analysis and design and of
theory and methods of systems analysis	113	132	for its current use and future	information retrieval systems.
and design.			development.	,
a6. Show a critical understanding of	A3	K2		A5. Know the role of human factors in the design of
technologies for the design, development	110		K6.The current and underlying	Information Technology systems.
and management of multi-user database			technologies that support computer	
systems and the implementation of			Processing and inter-computer	A6. Apply tools and techniques for the design and
database systems and information			communication.	development of applications.
retrieval systems.				
a7. Have a comprehensive knowledge and	A4	K2	K7.Principals of generating tests which	A7. Know methods for the construction of web-
critical awareness of the role of human			investigate the functionality of computer	based materials and systems, design of internet-based
factors in the design of Information			programs and computer systems and	systems.
Technology systems, issues of human-			evaluating their results.	

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.			K8.Management and economics principles relevant to computing and	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		information disciplines.  K9.Professional, moral and ethical issues	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	involved in the exploitation of computer technology and be guided by the appropriate professional, ethical and legal	A10. Understand the challenges inherent in the maintenance and evolution of IT based systems, and		
a10.Show a critical understanding of the broad context within computer information technology such as quality,	A8	K6	practices relevant to the computing and information industry.	the techniques and best practices currently available for dealing with them.		
reliability, enterprise, employment law, accounting, business and management and health.			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	K8		
number of application areas informed by			
the research directions of IT areas.			
a15.Describe the tools, practices and	K2		
methodologies used in the specification,			
design, implementation and critical			
evaluation of computer software			
systems.			
a16.Describe the methods used in defining	K3		
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	K5		
which investigate the functionality of			
computer programs and computer			
systems and evaluating their results.			

## Academic Standards (Intellectual Skills)

IT Program ILOs	Correspondin g 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,
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	patterns, main ideas, and errors.  B3. Summarize the proposed solutions ad their results.
b3. Summarize the proposed solutions ad their results.	В3	academic discipline.  I3. Identify criteria to measure and	B4. Restrict solution methodologies upon their results.
<ul><li>b4. Restrict solution methodologies upon their results.</li><li>b5. Establish criteria, and verify solutions.</li></ul>	B4 B5	interpret the appropriateness of a computer system for its current deployment and future evolution.	B5. Establish criteria, and verify solutions

b6.	Identify a range of solutions and critically evaluate and justify proposed design solutions.		В6	ΙΔ
b7.	Solve information technology problems with pressing commercial or industrial constraints.		В7	15
b8.	Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.		B8	Ιć
b9.	Perform problem analysis from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis).	I1	B9	17
b10.	Create and/or justify designs to satisfy given requirements (synthesis, evaluation, application).	13, 18	B10	18
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.	19	B11	Iè
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		

- I4. Analyze alternative computer systems and processes taking into account limitations, and quality constraints.
- I5. Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems.
- I6. Evaluate the results of tests to investigate the functionality of computer systems.
- I7. Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact.
- 18. Familiar with the professional, legal, moral and ethical issues relevant to the computing industry.
- Evaluate research papers in a range of knowledge areas.

- 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 and/or justify designs to satisfy given requirements (synthesis, evaluation, application).
- 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.

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

#### **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	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	limitations. P2. Implement comprehensive computing knowledge and skills in projects and in deployment of	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	computers to solve position practical problems. P3. Deploy the equipment and tools	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	used for the construction, maintenance and documentation of computer applications.	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	P4. Apply computing information retrieval skills in computing community environment and	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	industry. P5. Develop a range of fundamental research skills, through the use of	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	online resources, technical repositories and library-based material.	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	P2		P6. Design, implement, maintain, and	C8. Effectively employ information-retrieval skills,
facilities, plan and manage a project to			manage software systems.	(including the use of browsers, search engines, and on-
complete within budget and schedule			P7. Assess the implications, risks or	line library catalogues), communicate effectively using a
c10.Recognize the need for continuing	P2		safety aspects involved in the	variety of communication methods, and communicate
professional development in			operation of computing equipment	effectively with team members, managers and customers.
recognition of the need for lifelong			within a specific context.	
learning.			P8. Handle a mass of diverse data,	C9. Make effective use of general IT facilities, plan and
c11. Apply tools and techniques for the	P2	A5	assess risk and draw conclusions.	manage a project to complete within budget and
design and development of applications				schedule.
and projects.				
				C10. Manage one's own learning and development,
				including time management and organizational skills.
				C11. Present their work in the form of reports, oral
				presentations or an internet web site.

## Academic Standards (Transferable Skills)

IT Program ILOs	Corresponding in NARS	NARS ILOs – General	NARS ILOs – Special
d1. Collaborate effectively within multidisciplinary team.	T2	<ul> <li>T1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.</li> <li>T2. Demonstrate skills in group working, team management, time management and organizational skills.</li> <li>T3. Show the use of information-retrieval.</li> <li>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.</li> <li>T5. Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.</li> <li>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.</li> <li>T7. Show the use of general computing facilities.</li> </ul>	

			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	T4		inc-iong learning.
	14		
constraints.	TT(		
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	P6		
recognize the different roles of its members.			
d9. Employ information-retrieval skills, (including	T2	C5	
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	T1	C9	
with minimum guidance.	T3		
	T8		
d11. Prepare their work in the form of reports,	P4	C10	
oral presentations or an internet web site.	_ '		
d12. Exhibit appropriate numeracy skills in	T1		
understanding and presenting cases involving a			
quantitative dimension.			
quartamente difficilisioni.	1	1	

## **Academic Standards Matrix**

Knov	Knowledge and Understanding Skills												
NARS	Covering	NARS	Covering										
ILOs	ILOs in IT	ILOs	ILOs in IT										
General	Program	Special	Program										
K1	a1, a2, a3, a4	<b>A</b> 1	a1, a2, a13										
K2	a5, a6, a7, a15	A2	a3, a4										
К3	a11, a16	A3	a5, a6										
K4	a1, a2	A4	a7										
K5	a17	<b>A</b> 5	a17, c11										
K6	a10	<b>A</b> 6	a8										
<b>K</b> 7	a9	<b>A</b> 7	a9										
K8	a14	A8	a10										
		<b>A</b> 9	a11										
		A10	a12										

	Intellectu	ıal Skills	
NARS	Covering	NARS	Covering
ILOs	ILOs in IT	ILOs	ILOs in IT
General	Program	Special	Program
I1	b9	B1	b1
I2	b12	B2	b2
I3	b10	В3	b3
<b>I</b> 4	b13	B4	b4
I5	b14	B5	b4
<b>I</b> 6	b15	B6	b5
I7	b16	B7	b6
I8	b10, b17	B8	b7
<b>I</b> 9	b11,b18	В9	b8
		B10	b9
		B11	b10

Pı	ofessional and	Practical S	Skills
NARS ILOs General	Covering ILOs in IT Program	NARS ILOs Special	Covering ILOs in IT Program
P1	c5	<b>C</b> 1	c1
P2	c9,c10,c11	C2	c2
P3	c4	C3	c3
P4	d11	C4	c4
P5	d7	C5	d9
P6	d8	<b>C</b> 6	c5
<b>P</b> 7	c3	<b>C</b> 7	c6
		C8	<b>c</b> 7
		<b>C</b> 9	d10
		C10	d11
		C11	c8

	Transferable	skills	
NARS	Covering		
ILOs	ILOs in IT		
General	Program		
T1	d10, d12		
Т2	d1, d5, d6, d9, d12		
Т3	d10		
T4	d2		
T5	d14		
Т6	d3, d7		
<b>T7</b>	d4		
Т8	d10		

#### **IT Program Courses**

	Course	ani courses		Course	Course Title
	Code	Course Title		Code	Course ricie
	CS141	Programming Fundamentals		CS321	Operating Systems
	IT101	IT Fundamentals		CS351	Computer Graphics
	MATH101	Mathematics I		CS352	Image Processing
_	MATH102	Mathematics II		CS381	Software Development and Professional Practice
SVe	PHYS101	Physics I	eve	CS391	Software Engineering
1st Level	PHYS102	Physics II	3 <sup>rd</sup> Level	IT311	Network Security
1,	EE101	Electronics	ي ي	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			
	CS201	Discrete Structures		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	_		
2 <sup>nd</sup> Level	CE221	Computer Architecture	4 <sup>th</sup> Level		
- Le	MATH202	Probability and Statistics	Le		
<b>2</b> nc	HUM231	Business Administration	<b>4</b> th		
	HUM232	Technical Writing	_		
	HUM241	Computers and Ethics			
		İ		1	

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

	Elective Cours	ses		
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				P	<u>'r</u>	og	ra	an	1 N	<b>Vla</b>	tr	'IX	<u> </u>	((	0	ur	<b>'S</b> (	es	– N.	Aŀ	<u> </u>	G	er	<u>1e</u>	ra	II)								
AA   PHYS101		Course	K1	K2	КЗ	K4	K5	К6	К7	К8	11	12	13	14	15	16	17	18	19	P1	P2	Р3	P4	P5	P6	P7	T1	T2	Т3	T4	T5	Т6	T7	Т8
MATH101		CS141	✓	✓		✓	1		✓		Т															✓		✓		✓		<b>√</b>	✓	
MATHO2		IT101	✓	✓		✓			✓													✓				<b>V</b>		✓		✓		<b>√</b>	<b>√</b>	
PHYS101		MATH101	✓			✓																				✓						~		$\neg$
Physio2		MATH102	✓	✓		✓																✓				<b>√</b>		✓				~		
EE101		PHYS101	✓	✓		✓														<b>√</b>		✓				✓		✓		✓		~	<b>V</b>	
FE102		PHYS102	✓	✓		✓														✓		✓				✓		✓		✓		~	<b>√</b>	$\neg$
HUM111		EE101	✓	✓		✓														<b>√</b>		✓				✓		✓		✓		~	<b>V</b>	
HUM122		EE102	✓	✓		✓														✓		✓				✓		✓		✓		~	<b>√</b>	$\neg$
HUM121		HUM111	✓			✓																				✓		✓		✓		~	<b>V</b>	
HUM131	<u>-</u>	HUM112	<b>√</b>			✓																				✓		<b>√</b>		✓		~	<b>√</b>	
HUM131	-e	HUM121	✓			✓																			<b>√</b>	✓		✓		✓		~	<b>V</b>	
HUM131	st [	HUM122	✓			✓																				✓		✓		✓		~	<b>V</b>	
HUM133	` '	HUM131	✓			✓					Т															✓	Т	<b>√</b>		✓		✓	<b>√</b>	
HUM141		HUM132	✓			✓					Г														<b>√</b>	<b>√</b>	Т	<b>√</b>		✓		<b>√</b>	<b>√</b>	
HUM142		HUM133	✓	✓		✓	1				Т															✓		✓		✓		<b>√</b>	✓	
HUM151		HUM141	✓	✓		✓	1				Т															✓		<b>√</b>		✓		<b>√</b>	✓	
HUM152		HUM142	✓	✓		✓	1				Т															✓		✓		✓		<b>√</b>		
HUM153		HUM151	✓			✓																				✓		✓		✓		<b>√</b>		
HUM154		HUM152	✓	✓		✓	1		✓		Т											✓						<b>√</b>		✓		<b>√</b>		
S201		HUM153	✓			✓																				✓				✓		<b>√</b>		
No.   No.		HUM154	✓			✓																						<b>√</b>		<b>√</b>		✓		
No.   No.		CS201	✓			✓					Г											✓				✓		✓		✓		✓	✓	
		CS211	✓	✓		✓					✓		✓					✓	✓	✓		✓				✓		✓		✓		<b>✓</b>	✓	
S211		CS241	✓	✓		✓																✓				✓		✓		✓		~	<b>√</b>	
IS231	_	IS201	✓	✓		<b>✓</b>					✓		<b>√</b>					✓		<b>√</b>		✓				✓		✓				<b>V</b>	<b>√</b>	$\neg$
IS231	eve	IS211	<b>√</b>	✓		<b>✓</b>			✓											<b>√</b>		✓				✓		<b>√</b>		✓		<b>✓</b>	<b>√</b>	$\neg$
IS231	֖֖֖֖֖֖֖֖֖֖֖֖֖֖֡֝	IS212	✓	✓		<b>✓</b>														✓		✓				<b>V</b>		<b>√</b>				<b>V</b>	<b>√</b>	$\neg$
IT251	2	IS221	✓			<b>✓</b>																								✓		<b>√</b>	✓	
		IS231	✓	✓		<b>✓</b>						✓		<b>√</b>	<b>✓</b>	<b>√</b>			✓	✓		✓				✓		<b>√</b>		✓		<b>V</b>	<b>√</b>	$\neg$
CE221		IT251	✓	✓		<b>✓</b>														<b>√</b>		✓				✓		✓		✓		<b>√</b>	✓	
		CE221	✓	✓		<b>✓</b>																				✓		✓		✓		<b>√</b>	<b>√</b>	$\neg$

	MATH201	<b>√</b>			<b>√</b>																✓						✓		<b>√</b>		<b>~</b>	<b>V</b>	
	MATH202	<b>√</b>	<b>√</b>		<b>√</b>																✓				✓		✓		<b>√</b>		✓		
	EE201	<b>√</b>			<b>√</b>														П		✓						✓		<b>√</b>		✓	<b>√</b>	
	HUM231	<b>√</b>			✓														П						✓		✓		<b>√</b>		✓	✓	
	HUM232	<b>√</b>			✓																				✓		✓		<b>√</b>		✓	✓	
	HUM241	<b>√</b>			✓																						✓		<b>√</b>		✓	✓	
	CS301	<b>√</b>	<b>√</b>		✓														П														
	CS302	<b>√</b>			<b>√</b>																						✓				✓		
	CS321	<b>√</b>	<b>√</b>		✓														✓		✓				✓		✓		<b>√</b>				
	CS341	<b>√</b>	<b>√</b>		✓														✓		✓				✓		✓		<b>√</b>		✓	<b>V</b>	
	CS351	<b>√</b>	<b>✓</b>		✓																✓				<b>V</b>		✓		<b>√</b>		<b>V</b>	<b>V</b>	
	CS352	<b>√</b>	<b>✓</b>		✓														✓		✓				<b>V</b>		✓		<b>√</b>		<b>V</b>	✓	
l _	CS381	<b>√</b>	<b>√</b>		<b>√</b>		✓	<b>√</b>		<b>√</b>	✓	<b>√</b>	✓	<b>√</b>	✓		<b>√</b>	✓	<b>√</b>		✓				<b>~</b>		✓		<b>√</b>		<b>√</b>	<b>V</b>	
3 <sup>rd</sup> Level	CS391	<b>√</b>	<b>√</b>		<b>√</b>		✓	<b>√</b>	П	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>		<b>√</b>	<b>√</b>	<b>√</b>		<b>√</b>				<b>V</b>		✓		<b>√</b>		<b>√</b>	<b>V</b>	_
ΓE	IS321	<b>√</b>			✓																						✓						
370	IT311	<b>√</b>	<b>√</b>		✓					<b>√</b>									<b>√</b>		✓				<b>√</b>	Г	✓		<b>√</b>		<b>V</b>	<b>V</b>	_
	IT331	<b>√</b>	<b>√</b>		<b>√</b>	<b>V</b>															<b>√</b>				<b>V</b>		✓		<b>√</b>		<b>√</b>	<b>V</b>	_
	IT351	<b>√</b>	<b>√</b>		<b>√</b>	<b>V</b>	<b>V</b>	<b>V</b>											<b>√</b>		<b>√</b>			<b>V</b>	<b>V</b>		✓		<b>√</b>		<b>√</b>	<b>V</b>	_
	IT361	<b>√</b>	<b>√</b>		<b>√</b>			<b>√</b>		<b>√</b>	<b>√</b>	<b>√</b>	✓	✓	<b>√</b>		<b>√</b>	✓	<b>√</b>		✓	✓		<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>		✓	✓	✓
	IT371	<b>√</b>	<b>√</b>		<b>√</b>				✓	П									<b>√</b>		✓		✓		✓	Т	<b>√</b>		<b>√</b>		✓	✓	
	MM301	<b>√</b>			<b>√</b>														<b>√</b>		<b>√</b>			<b>√</b>	✓	Т	<b>√</b>		<b>√</b>		✓	✓	
	MATH301	<b>√</b>			<b>√</b>														<b>√</b>		<b>√</b>				✓	Т	<b>√</b>		<b>√</b>		<b>√</b>	<b>√</b>	
	IT431	<b>√</b>	<b>√</b>		<b>√</b>			<b>√</b>		П									<b>√</b>		✓				✓	Т	<b>√</b>		<b>√</b>		✓	✓	
	IT451	<b>√</b>	<b>√</b>		<b>√</b>		✓	<b>√</b>		<b>√</b>	✓	✓	✓				<b>√</b>	✓	<b>√</b>		✓				✓		✓		<b>√</b>		<b>√</b>	<b>V</b>	
	IT432	<b>√</b>	<b>√</b>		<b>√</b>			<b>√</b>											<b>√</b>						✓		✓		<b>√</b>		<b>√</b>	<b>V</b>	
	IT441	<b>√</b>	<b>√</b>		<b>√</b>				<b>V</b>										<b>√</b>		✓		✓		✓		✓		<b>√</b>		<b>√</b>	<b>V</b>	
	IT471	<b>√</b>	<b>√</b>		✓																				<b>√</b>	Г	✓		<b>√</b>		<b>V</b>	<b>V</b>	_
	IT433	<b>√</b>	<b>V</b>	<b>√</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>										<b>√</b>		<b>√</b>				<b>V</b>		✓		<b>√</b>		<b>√</b>	<b>V</b>	_
	IT452	<b>√</b>	<b>√</b>		✓														<b>√</b>		✓				<b>√</b>	Г	✓		<b>√</b>		<b>V</b>	<b>V</b>	_
	IT461	<b>√</b>	<b>√</b>		<b>√</b>			<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>		<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>		~	<b>√</b>	<b>√</b>
ve	IT462	<b>√</b>	<b>V</b>		<b>√</b>			<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>		<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>		<b>√</b>	<b>V</b>	✓
4 <sup>th</sup> Level	CS451	<b>√</b>	<b>V</b>		<b>√</b>														<b>√</b>		<b>√</b>				<b>√</b>		✓		<b>√</b>		<b>√</b>	<b>V</b>	
4₽	CS431	<b>√</b>	<b>V</b>		<b>√</b>			<b>√</b>													<b>√</b>				<b>√</b>		✓		<b>√</b>		<b>√</b>	<b>V</b>	
	CS452	<b>√</b>			<b>√</b>					Ħ															<b>√</b>	H	<b>√</b>		<b>√</b>		✓	<b>√</b>	
	CS461	<b>√</b>			<b>√</b>																<b>√</b>				✓		<b>√</b>		<b>√</b>		✓	<b>√</b>	
	IS411	<b>√</b>			<b>√</b>																						<b>√</b>		<b>√</b>		<b>√</b>	<b>√</b>	
	IS412	<b>√</b>			<b>√</b>																<b>√</b>				<b>√</b>		<b>√</b>		<b>√</b>		<b>√</b>	<b>√</b>	
	MM402	<b>√</b>			<b>√</b>														<b>√</b>		<b>√</b>				<b>√</b>		<b>√</b>		<b>√</b>		<b>√</b>	<b>√</b>	
	CE421	<b>√</b>	<b>√</b>		<b>√</b>														<b>√</b>		<b>√</b>				<b>√</b>	_	<b>√</b>		<b>√</b>		<b>√</b>	<b>√</b>	
	CE422	<b>√</b>	· 🗸		<b>√</b>														<b>√</b>		<b>√</b>				<b>√</b>	_	<b>√</b>		<b>√</b>				
		-	-		K4		К6	K7	к8	l1	12	13	14	15	16	17	18	19	_	P2			P5	Р6		_		Т3		T5	Т6	T7	Т8

# Program Matrix II (Courses - NARS Special) - Part 1

	Course	A1	A2	А3	A4	A5	A6	A7	A8	A9	A10	B1	В2	В3	B4	В5	В6	В7	В8	В9	B10	B11
	CS141																					
	IT101													$  \sqrt{ }$								
	MATH																					
	MATH														$\sqrt{}$							
<u>–</u>	PHYS1																					
-evel	PHYS1																					
1 <sup>st</sup>	EE101		$\sqrt{}$										$\sqrt{}$		$\sqrt{}$							
` '	EE102						$\sqrt{}$								$\sqrt{}$							
	HUM1																					
	HUM1												$\sqrt{}$									
	HUM1																					

	HUM1	V									V	V	1								
	HUM1	<b>√</b>	V						H		1	1	<b>√</b>	-							
	HUM1	$\sqrt{}$	V								1	1	\ √								
	HUM1	$\sqrt{}$	V	V					H		1	1	V	-							
	HUM1	$\sqrt{}$	1	1					H		1	1		V	V						
	HUM1	2/	2/	1							2/	2/	\ √	2/	1	2/					
	HUM1		2/	V					H		2/	V	V	$\sqrt{}$	1	V					
	HUM1	$\sqrt{}$	$\sqrt{\frac{1}{\sqrt{1}}}$	V							\ \ \ \	V	1	V	V						
	HUM1	$\sqrt{}$	V	V			V		H		V	1	\ √	-							
	HUM1	$\sqrt{}$	V						H		V	√ √	V	-							
	CS201	$\sqrt{}$									V	V		V	V	N	V				
	CS211	V	V								V	V	V	V	V	V	V				V
	CS241	Ż	Ì	V							Ì	V	Ì	V	Ì	Ì		,	,	,	
	IS201	Ż	Ż	Ż		V					V	Ż	Ì	Ż	Ž	Ż	1		<b>V</b>	$\sqrt{}$	<b>V</b>
	IS211	Ż	V	Ť	Ť						V	V	V	V	Ì		Ť	·	·	Ť	
	IS212	Ż	V								V	V	V	V	Ì	<b>V</b>					
	IS221	Ż		Ċ	Ť						V	,	Ţ	Ť	Ť		Ţ	·	·		
le/	IS231	Ż	1	1		V					V	1									
2 <sup>nd</sup> Level	IT251	Ż	Ż	Ż	Ì						V	Ż	Ì	Ż	Ì	Ì	V				
5nd	CE221	Ż	V	V	V						V	V	V	$\overline{}$	V						
``	MATH	. 1	1	Ė	Ė									<u> </u>		.1					
		1	1	I							1	1	<b>√</b>	<b>V</b>	1	1	1				
	MATH	<b>V</b>	<b>√</b>	√							1	1	1	1	√	1	1				
	EE201		√									ļ ,									
	HUM2		,								1	1									
	HUM2	1	√								1	1	1								
	HUM2		,								1										
	CS301	1	1	1							1	1									
	CS302 CS321	$\sqrt{}$	1	.1	. 1	. 1			$\vdash$		1	1	1	1	1	.1					
		$\sqrt{}$	1	1	1	√					1	1	1	$\sqrt{}$	1	1					
	CS341 CS351	1	1	1	. 1						1	1	1	1	1	1	.1				
	CS351	1	1	1	1	. 1					1	1	1	1	1	1	1				
	CS381	1	1	1	<b>1</b>	1	اما	اء			1	1	1	1	1	1	1	٦	٦	ما	
<u>e</u>	CS391	$\sqrt{}$	√ √	1	√ √	√ √	√ √		$\vdash$		√ √	√ √	√ √	√ √	√ √	<u>ν</u>	√ √	$\sqrt{}$	$\sqrt{}$	√ √	√ √
Le	IS321	\ √	V	V	V	V	٧	٧	$\vdash$		1	V	V	V	V	V	٧	V	V	٧	V
3 <sup>rd</sup>	IT311	$\sqrt{}$	2/	2/	٦	ما					1	1	2	ما	اما	2	2	ار	٦	ما	
,	IT331	-	1	1	1	1					1	1	1	٧ ما	1	√	1	1	7	1	
	IT351	$\frac{}{}$	1	\ √	ν 1	1	V	<b>√</b>			\ \ √	\ \ √	1	<b>1</b>	1	<b>√</b>					
	IT361	\ √	1	1	1	√ √	\ √	V			1		\ √	1	1	√ √	١		اء		V
	IT371	- 1	1	1	1	1	·V		H		1	1		√	V	Ŋ	1	·V	V	·V	V
	MM30	$\sqrt{}$	\ \ √	·V	7	7					\ \ \ \	\ \ \ \	$\sqrt{}$		V						
	MATH	$\sqrt{}$	\ \_\_\								1	1	√ √	۷ ما	\ \ √	٦/	1				
	IT431	$\sqrt{}$	1			V	٦/				1	1	1	$\sqrt{}$	1	۷ √	1				
	IT451	1	$\sqrt{\frac{1}{}}$	1	√ √	1	√ √				1	1	\ √	7	$\sqrt{}$	$\sqrt{}$	1		1	<b>V</b>	<b>V</b>
	IT432	$\sqrt{}$	V	V	1	V	V	,			V	V	1	1	V	Ť	V	,	,	,	
	IT441	Ì	V	V		,	Ť				V	V	V	V	V	Ť					
	IT471	V	V	V							V	V	Ť	Ė	H	,					
	IT433	V	V	V	1	V				V	V	V	1			1	1				
	IT452	Ì	V	Ż	Ì		Ė	Ť	Ė		V	Ì	Ì	Ż	Ì	Ż	Ì	•			
ve	IT461	Ż	V	V	V						V	V	V	$\overline{}$	V	V					<b>V</b>
4 <sup>th</sup> Level	IT462	V	V	V	V	V	V				V	Ì	V	V	V	V	V	Ì	Ì	V	V
4 <sup>t‡</sup>	CS451	V	V	V							V	V	V								
	CS431	V	V	V		V					V	V	V	$\sqrt{}$							
	CS452	V									V	V	1		V						
	CS461	V	V								V	V	V	<u> </u>	Ì						
	IS411	V	V								V	V	V								
	IS412	V	V								V	V	V	$\sqrt{}$	V	V	V				
	MM40	V	V								V		V		Ì	V	,				
	·	_ `					_									,	_				ſ

CE421											$\sqrt{}$										
CE422																					
	A1	A2	АЗ	A4	A5	A6	A7	A8	A9	A10	B1	B2	В3	B4	В5	В6	В7	В8	В9	B10	B11

## Program Matrix II (Courses - NARS Special) - Part 2

9-1	Course	C1	C2	СЗ	C4	C5	C6	C7	C8	C9	C10	C11
	CS141	✓	✓	<b>√</b>								:
	IT101	✓	<b>√</b>	<b>√</b>	<b>√</b>							
	MATH101	✓	<b>√</b>	<b>√</b>								
	MATH102	✓	<b>√</b>	<b>√</b>	✓							
	PHYS101	✓	<b>✓</b>	<b>√</b>	<b>√</b>		<b>√</b>	<b>✓</b>				
	PHYS102	✓	<b>√</b>	<b>√</b>	<b>√</b>		✓					
	EE101	✓	<b>√</b>	<b>√</b>	<b>√</b>		<b>√</b>					
	EE102	✓	<b>√</b>	<b>√</b>	<b>√</b>		<b>√</b>					
	HUM111	✓	<b>√</b>	<b>√</b>								
<u></u>	HUM112	✓	<b>√</b>	<b>√</b>								
eve	HUM121	✓	<b>√</b>	<b>√</b>		<b>√</b>						
1 <sup>st</sup> Level	HUM122	✓	<b>√</b>	<b>√</b>								
1	HUM131	✓	<b>√</b>	<b>√</b>								
	HUM132	· ✓	✓	√		<b>√</b>				-		
	HUM133	· ✓	✓	✓								
	HUM141	√	✓	✓						-		
	HUM142		√	· ✓								
	HUM151	<b>√</b>	✓	√								
	HUM152	<b>√</b>	<b>√</b>		<b>√</b>					-		
	HUM153	<b>√</b>		<b>√</b>						-		
	HUM154	<b>√</b>			:							:
	CS201	· ✓	<b>√</b>	<b>√</b>	<b>√</b>							
	CS211	· ✓	· ✓	· ✓	√ ·		<b>√</b>	<b>✓</b>	<b>√</b>			
	CS241	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>							
	IS201	<b>√</b>	<b>✓</b>	<b>√</b>	<b>√</b>		<b>√</b>	<b>✓</b>				<b>√</b>
	IS211	<b>√</b>	<b>✓</b>	<b>✓</b>	<b>√</b>		<b>√</b>	<b>✓</b>				
	IS212	<b>√</b>	<b>✓</b>	<b>✓</b>	<b>√</b>		<b>√</b>	<b>✓</b>				
	IS221	<b>√</b>										
le/	IS231	<b>√</b>	<b>√</b>	<b>✓</b>	<b>√</b>		<b>✓</b>					
2 <sup>nd</sup> Level	IT251	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>		<b>√</b>					
pu <b>Z</b>	CE221	<b>√</b>	<b>√</b>	<b>√</b>								
, ,	MATH201	<b>√</b>			<b>√</b>							
	MATH201	<b>√</b>	<b>/</b>	<b>√</b>	<b>√</b>							
	EE201	· ✓			· ✓							
		<b>√</b>	<b>√</b>	<b>√</b>	<b>,</b>							
	HUM231	<b>√</b>	<b>∨</b>	<b>∨</b>								
	HUM232	<b>√</b>	<b>√</b>	,								
	HUM241	<b>√</b>	<b>√</b>									
	CS301 CS302	<b>√</b>	<b>✓</b>									
	CS321	· ✓	· ·	<b>✓</b>	<b>√</b>		<b>✓</b>					
	CS341	· ✓	· ✓	· ✓	√ ·		· ·					
	CS351	· ✓	· ·	· ✓	√ ·							
3 <sup>rd</sup> Level	CS352	· ✓	· ·	· ·	·		<b>√</b>					
٦٢	CS381	, √	· ·	· ·	·		· ✓	<b>√</b>				
3,	CS391	<b>,</b> ✓	<b>▼</b>	· ·	<b>v</b> ✓		<b>v</b>	<b>✓</b>				
		<b>,</b> ✓	Ť	Ļ	_		_	<del> </del>				
	IS321	<b>√</b>	<b>V</b>	<b>✓</b>	<b>√</b>		<b>√</b>	<b>✓</b>	<b>✓</b>			
	IT311	<b>V</b>	V V	<b>V</b>	<b>∨</b>		<u> </u>	ļ ·	1			
	IT331	ľ			•							

	IT351	✓	<b>✓</b>	✓	✓		<b>✓</b>	<b>✓</b>	<b>✓</b>			
	IT361	✓	✓	✓	✓	✓	✓			✓	✓	
	IT371	✓	✓	✓	✓		✓					
	MM301	✓	✓	✓	✓	✓	✓	✓	✓			
	MATH301	✓	✓	✓	✓		✓	✓	✓			
	IT431	✓	✓	✓	✓		✓					
	IT451	✓	✓	✓	<b>√</b>		✓	✓	✓			
	IT432	✓	✓	✓	✓		✓					
	IT441	✓	✓	✓	✓		✓	✓				
	IT471	✓	✓	✓								
	IT433	✓	✓	✓	✓		✓	✓	✓			
	IT452	✓	✓	✓	✓		✓					
l _	IT461	✓	✓	✓	<b>√</b>	✓	✓			✓	✓	
s.	IT462	✓	✓	✓	<b>√</b>	✓	✓			<b>√</b>	✓	
4 <sup>th</sup> Level	CS451	✓	✓	✓	✓		✓	✓				
4 <sup>t</sup>	CS431	✓	✓	✓	<b>√</b>							
	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	аЗ	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17
	CS141	Programming Fundamentals	✓	<b>1</b>	✓	<b>✓</b>	✓	<b>√</b>	✓	✓	✓				✓				
	IT101	IT Fundamentals	✓	<b>V</b>	<b>√</b>	<b>✓</b>	<b>✓</b>	<b>✓</b>		<b>√</b>	<b>√</b>				<b>√</b>				
	MATH101	Mathematics I	✓	<b>V</b>											<b>√</b>				
	MATH102	Mathematics II	✓	<b>V</b>	✓	~	<b>√</b>								<b>√</b>				
	PHYS101	Physics I	✓	<b>√</b>	✓	~	✓	~							✓				
	PHYS102	Physics II	✓	<b>√</b>	✓	<b>~</b>	✓	<b>√</b>	✓						✓				
	EE101	Electronics	✓	<b>√</b>	✓	<b>\</b>	<b>√</b>								✓				
	EE102	Digital Circuits	✓	<b>√</b>	✓	<b>V</b>	✓	<b>√</b>	✓	✓					✓				
	HUM111	English Language I	✓												<b>√</b>				
_	HUM112	English Language II	<b>√</b>												<b>V</b>				
eve	HUM121	Social Context of Computing	✓	<b>√</b>	<b>√</b>										✓				
1st Level	HUM122	Intellectual Property	✓	<b>√</b>											✓				
	HUM131	Organizational Behavior	✓	<b>√</b>											✓				
	HUM132	Interpersonal Communication	✓	<b>√</b>	✓										✓				
	HUM133	Computing Economics	✓	<b>V</b>	✓	<b>~</b>	<b>√</b>	<b>✓</b>							✓				
	HUM141	Computer Law	✓	<b>V</b>	✓	~	<b>√</b>								✓				
	HUM142	Privacy and Civil Liberties	✓	<b>√</b>	✓	<b>~</b>	✓								✓				
	HUM151	Hand Drawing	✓	<b>√</b>	✓	<b>*</b>									✓				
	HUM152	History of Computing		✓		~	✓	~			✓								
	HUM153	Islamic Culture	✓	<b>V</b>	✓										✓				
	HUM154	Scientific Thinking	✓	<b>√</b>											✓				
	CS201	Discrete Structures	✓	<b>√</b>											✓				
	CS211	Data Structures and Algorithms	✓	<b>√</b>	✓	~	✓								✓				
	CS241	Object-Oriented Programming	✓	<b>V</b>	✓	~	✓								<b>√</b>				
	IS201	Foundations of Information Systems	✓	<b>V</b>	✓	<b>~</b>	✓	✓	✓	✓					✓				
	IS211	File Organization	✓	<b>V</b>	✓	<b>V</b>		✓	✓	✓	✓				✓				П
2nd Level	IS212	Databases	✓	<b>V</b>	✓	~	✓	<b>√</b>	✓						✓				
	IS221	Project Management	✓												✓				
	IS231	Systems Analysis and Design	✓							<b>√</b>					<b>√</b>				
	IT251	Data Communications	✓	<b>1</b>	<b>✓</b>	<b>\</b>	<b>~</b>	<b>~</b>	<b>✓</b>						✓				
	CE221	Computer Architecture	✓	<b>√</b>	✓	~	~	~	✓	✓					✓				
	MATH201	Mathematics III	<b>√</b>	<b>V</b>	<b>✓</b>										~				

	MATH202	Probability and Statistics	✓	✓	<b>√</b>	<b>√</b>	<b>V</b>								✓				
	EE201	Digital Signal Processing	<b>√</b>	<b>√</b>	<b>~</b>										✓				_
	HUM231	Business Administration	<b>√</b>	<b>√</b>											<b>√</b>				
	HUM232	Technical Writing	<b>√</b>	<b>√</b>	<b>√</b>										<b>√</b>				
	HUM241	Computers and Ethics	✓	<b>√</b>											✓				
	CS301	Operation Research	✓		<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>							✓				
	CS302	Simulation and Modeling	✓	✓	✓	<b>√</b>									✓				
	CS321	Operating Systems	✓	✓	<b>√</b>	✓	V	<b>V</b>	<b>√</b>	<b>V</b>					✓				
	CS341	Visual Programming	✓	✓	<b>√</b>	✓	V	<b>V</b>							✓				
	CS351	Computer Graphics	✓	✓	✓	✓	<b>√</b>	<b>V</b>	<b>V</b>						✓				
	CS352	Image Processing	✓	✓	✓	<b>√</b>	<b>√</b>	<b>V</b>	✓	<b>√</b>					✓				
	CS381	Software Development and Professional Practice	<b>√</b>			<b>√</b>				<b>√</b>		✓			✓				
evel	CS391	Software Engineering	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓			✓				
3rd Level	IS321	Advanced Project Management	✓												✓				
	IT311	Network Security	✓	✓	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>					✓				
	IT331	Network Management	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>V</b>	<b>√</b>	<b>√</b>						✓				✓
	IT351	Computer Networks	✓	✓	<b>√</b>	✓	<b>V</b>	<b>V</b>	<b>√</b>	<b>√</b>	<b>√</b>	✓			✓				
	IT361	Field Training	✓	✓	<b>√</b>				✓				✓						
	IT371	Web Programming	✓	✓	<b>√</b>	✓	<b>V</b>	<b>V</b>	<b>√</b>	<b>√</b>					✓				
	MM301	Introduction to Multimedia Technology	<b>√</b>	✓	<b>√</b>										✓				
	MATH301	Numerical Analysis	✓	✓	<b>√</b>										✓				
	IT431	Wireless and Mobile Computing	✓	✓	<b>√</b>	✓			✓	✓	<b>√</b>				✓				
	IT451	Network Analysis and Design	✓	✓	✓	<b>√</b>	✓	<b>V</b>	<b>√</b>	<b>√</b>	<b>V</b>	✓			✓				
	IT432	Network Programming	✓	✓	✓	✓	<b>V</b>	<b>V</b>	<b>√</b>	<b>V</b>	<b>√</b>				✓				
	IT441	Enterprise Architecture	✓	✓	<b>√</b>	✓	<b>√</b>	<b>V</b>							✓				
	IT471	E-commerce	✓	✓	<b>√</b>	✓	<b>√</b>	<b>V</b>							✓				
9 <b>1</b>	IT433	Network Forensics	✓	✓	✓	<b>√</b>	<b>√</b>	~	<b>V</b>	<b>√</b>	~	✓	✓	✓	✓	✓	✓	✓	✓
4th Level	IT452	Networked Embedded Systems	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>V</b>	<b>V</b>						✓		$\dashv$	$\exists$	
<b>4</b> th	IT461	Capstone Project I	✓	✓	<b>√</b>	<b>√</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>				✓				
	IT462	Capstone Project II	✓	✓	<b>√</b>	<b>√</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>				✓				
	CS451	Computer Animation	✓	✓	<b>√</b>	<b>√</b>	<b>V</b>								✓				
	CS431	Parallel Computation	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>				✓		$\dashv$	$\exists$	
	CS452	Computer Vision	✓	✓	<b>√</b>										✓		$\top$	$\exists$	
	CS461	Intelligent Systems	<b>√</b>	✓	✓	<b>√</b>									✓				

IS411	Advanced Database	<b>√</b>	✓	✓										✓				
IS412	Distributed and Object Databases	✓	✓	✓										✓				
MM402	Virtual Reality	✓	<b>√</b>	✓	✓									✓				
CE421	Advanced Computer Architecture	<b>√</b>	<b>√</b>	✓	✓	✓	✓							✓				
CE422	Embedded Systems	<b>√</b>	✓	✓	✓	✓	✓	<b>√</b>	<b>√</b>					✓				
		a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17

## Program Matrix IV (Courses - Intellectual Skills)

	Code	Course	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12	b13	b14	b15	b16	b17	b18
	CS141	Programming Fundamentals	✓	<b>√</b>	✓	<b>V</b>	✓													
	IT101	IT Fundamentals	<b>√</b>	<b>√</b>	~															
	MATH101	Mathematics I	✓	<b>√</b>	~	~	<b>√</b>	<b>√</b>												
	MATH102	Mathematics II	<b>✓</b>	<b>√</b>	~	~	<b>√</b>	<b>√</b>												
	PHYS101	Physics I	<b>√</b>	<b>✓</b>	<b>√</b>	<b>V</b>														
	PHYS102	Physics II	<b>√</b>	<b>✓</b>	<b>√</b>	~														
	EE101	Electronics	<b>√</b>	<b>✓</b>	<b>√</b>	~	✓	✓												
	EE102	Digital Circuits	<b>√</b>	<b>✓</b>	~	~	✓	✓												
	HUM111	English Language I	<b>√</b>	<b>√</b>																
	HUM112	English Language II	<b>√</b>	<b>√</b>	~															
-	HUM121	Social Context of Computing	<b>√</b>	<b>√</b>	~															
1st Level	HUM122	Intellectual Property	✓	<b>√</b>	~															
$1^{st}$	HUM131	Organizational Behavior	✓	<b>✓</b>																
	HUM132	Interpersonal Communication	<b>√</b>	<b>√</b>	~															
	HUM133	Computing Economics	<b>√</b>	<b>√</b>	~	<b>✓</b>	✓													
	HUM141	Computer Law	<b>√</b>	<b>✓</b>	<b>✓</b>	<b>✓</b>														
	HUM142	Privacy and Civil Liberties	<b>√</b>	<b>√</b>	<b>✓</b>	<b>✓</b>														
	HUM151	Hand Drawing	✓			<b>✓</b>														
	HUM152	History of Computing	<b>✓</b>	<b>√</b>	<b>✓</b>															
	HUM153			<b>√</b>	<b>✓</b>															
		Islamic Culture	<b>_</b> ✓	<b>√</b>																
	HUM154	Scientific Thinking																		
THE STATE OF	CS201	Discrete Structures	✓	<b>√</b>	~	<b>V</b>	✓	<b>√</b>												
Leve	CS211	Data Structures and Algorithms	<b>√</b>	<b>√</b>	~	<b>V</b>	✓	✓	✓	✓	✓	<b>√</b>	<b>√</b>						<b>√</b>	✓
2 <sup>nd</sup>	CS241	Object-Oriented Programming	✓	<b>√</b>	~	<b>V</b>	✓													
2nd Level	HUM154 CS201 CS211	Discrete Structures  Data Structures and Algorithms	<b>✓</b>	\ \ \	✓ ✓	✓ ✓	<b>✓</b>	<b>√</b>	<b>✓</b>	<b>✓</b>	✓	✓	<b>✓</b>						<b>√</b>	

	IS201	Foundations of Information Systems	<b>√</b>	✓	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓						✓	
	IS211	File Organization	✓	✓	<b>√</b>	<b>√</b>													
	IS212	Databases	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>												
	IS221	Project Management	✓																
	IS231	Systems Analysis and Design	✓	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>			✓	✓	<b>√</b>	✓	✓		✓
	IT251	Data Communications	✓	<b>√</b>	✓	<b>√</b>	<b>√</b>												
	CE221	Computer Architecture	✓	✓	<b>√</b>	<b>√</b>													
	MATH201	Mathematics III	✓	<b>√</b>	✓	<b>√</b>	<b>√</b>												
	MATH202	Probability and Statistics	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>											
	EE201	Digital Signal Processing	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>												
	HUM231	Business Administration	<b>√</b>	✓	<b>✓</b>														
	HUM232	Technical Writing	<b>√</b>	✓	<b>√</b>														
	HUM241	Computers and Ethics	<b>√</b>		<b>√</b>														
	CS301	Operation Research	✓	✓	✓														
	CS302	Simulation and Modeling	<b>√</b>	✓	✓	<b>√</b>													
	CS321	Operating Systems	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓												
	CS341	Visual Programming	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓												
	CS351	Computer Graphics	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	~											
	CS352	Image Processing	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>												
	CS381	Software Development and Professional Practice	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>V</b>	<b>V</b>	✓	<b>√</b>	✓	<b>V</b>	<b>✓</b>	<b>√</b>	✓	<b>√</b>
'el	CS391	Software Engineering	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>~</b>	<b>√</b>	<b>V</b>	<b>V</b>	✓	V	✓	<b>V</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>
3rd Level	IS321	Advanced Project Management	<b>√</b>																
	IT311	Network Security	✓	✓	✓	✓	✓	<b>√</b>	✓	<b>V</b>	<b>√</b>								
	IT331	Network Management	✓	✓															
	IT351	Computer Networks	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>												
	IT361	Field Training	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>V</b>	<b>√</b>	✓	<b>V</b>	✓	<b>V</b>	<b>√</b>	✓	✓	<b>√</b>
	IT371	Web Programming	✓	<b>√</b>	<b>√</b>														
	MM301	Introduction to Multimedia Technology	<b>√</b>	✓	✓	<b>√</b>													
	MATH301	Numerical Analysis	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>V</b>											
	IT431	Wireless and Mobile Computing	✓	✓	<b>√</b>	✓	✓	<b>√</b>											
evel	IT451	Network Analysis and Design	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>V</b>	<b>√</b>	✓	<b>V</b>	✓	<b>V</b>			✓	<b>√</b>
4th Level	IT432	Network Programming	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>											
	IT441	Enterprise Architecture	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>												

IT471	E-commerce	<b>√</b>	<b>√</b>																
IT433	Network Forensics	<b>√</b>	✓	~	<b>V</b>	<b>V</b>	<b>√</b>	<b>√</b>											
IT452	Networked Embedded Systems	<b>√</b>	✓	<b>~</b>	~	~													
IT461	Capstone Project I	<b>√</b>	✓	~	~	<b>V</b>	<b>√</b>	<b>√</b>	V	<b>V</b>	✓	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓	✓	<b>√</b>
IT462	Capstone Project II	<b>√</b>	✓	~	<b>V</b>	<b>1</b>	~	<b>√</b>	<b>V</b>	V	✓	✓	✓	<b>√</b>	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>
CS451	Computer Animation	✓	✓	~															
CS431	Parallel Computation	✓	✓	~	<b>V</b>	<b>1</b>													
CS452	Computer Vision	<b>√</b>	✓	~	~														
CS461	Intelligent Systems	<b>√</b>	✓	~															
IS411	Advanced Database	<b>√</b>	✓	~	~	~	<b>√</b>												
IS412	Distributed and Object Databases	<b>√</b>	✓	~	<b>V</b>	<b>V</b>	<b>√</b>												
MM402	Virtual Reality	<b>√</b>		~		<b>√</b>													
CE421	Advanced Computer Architecture	✓	✓	<b>V</b>	<b>1</b>	<b>V</b>													
CE422	Embedded Systems	<b>√</b>	✓	~	1	<b>1</b>													
		b1	b2	b3	b4	b5	b6	Ь7	b8	b9	b10	b11	b12	b13	b14	b15	b16	b17	b18

## **Program Matrix V (Courses - Professional and Practical Skills)**

	Code	Course	c1	c2	сЗ	c4	с5	с6	с7	c8	с9	c10	C11
	CS141	Programming Fundamentals	<b>√</b>	✓	✓								
	IT101	IT Fundamentals	✓	<b>√</b>	✓	✓							
	MATH101	Mathematics I	✓	<b>√</b>	✓								
	MATH102	Mathematics II	✓	<b>√</b>	✓	✓							
	PHYS101	Physics I	<b>√</b>	<b>√</b>	✓	<b>√</b>	~	<b>V</b>					
	PHYS102	Physics II	<b>√</b>	<b>√</b>	✓	<b>√</b>	~						
1st Level	EE101	Electronics	<b>√</b>	<b>√</b>	✓	✓	<b>V</b>						
$1^{st}$	EE102	Digital Circuits	<b>√</b>	<b>√</b>	✓	✓	<b>V</b>						
	HUM111	English Language I	<b>√</b>	<b>√</b>	✓								
	HUM112	English Language II	<b>√</b>	✓	✓								
	HUM121	Social Context of Computing	<b>√</b>	✓	✓								
	HUM122	Intellectual Property	<b>√</b>	<b>√</b>	✓								
	HUM131	Organizational Behavior	<b>√</b>	<b>√</b>	✓								

I	HUM133										1	
<u> </u>	110111133	Computing Economics	✓	✓	✓							
1 1	HUM141	Computer Law	<b>√</b>		✓							
lt	HUM142	Privacy and Civil Liberties		<b>√</b>	<b>√</b>							
lt	HUM151	Hand Drawing	<b>√</b>	<b>√</b>	<b>√</b>							
lt	HUM152	History of Computing	<b>√</b>	<b>√</b>								
lt	HUM153	Islamic Culture	<b>√</b>		✓							
lt	HUM154	Scientific Thinking	<b>√</b>									
П	CS201	Discrete Structures	<b>√</b>	<b>√</b>	✓	<b>√</b>						
	CS211	Data Structures and Algorithms	<b>√</b>									
	CS241	Object-Oriented Programming	✓	✓	<b>√</b>	✓						
	IS201	Foundations of Information Systems	✓	✓	<b>V</b>	<b>√</b>	✓	<b>√</b>		<b>~</b>		
	IS211	File Organization	✓	✓	✓	✓	✓	✓				
	IS212	Databases	✓	✓	✓	✓	✓	✓				
	IS221	Project Management	<b>√</b>									
ev.	IS231	Systems Analysis and Design	<b>√</b>	<b>√</b>	<b>V</b>	<b>V</b>	<b>√</b>					
2nd I	IT251	Data Communications	<b>√</b>	<b>√</b>	✓	✓	✓					
	CE221	Computer Architecture	<b>✓</b>	<b>√</b>	✓							
	MATH201	Mathematics III	✓			✓						
	MATH202	Probability and Statistics	✓	<b>√</b>	<b>√</b>	✓						
	EE201	Digital Signal Processing	<b>√</b>			<b>√</b>						
	HUM231	Business Administration	✓	✓	✓							
	HUM232	Technical Writing	✓	✓	V							
	HUM241	Computers and Ethics	<b>√</b>	<b>√</b>								
	CS301	Operation Research	✓	✓								
	CS302	Simulation and Modeling	✓	✓								
	CS321	Operating Systems	✓	✓	✓	✓	✓					
	CS341	Visual Programming	✓	✓	✓	✓	✓					
vel	CS351	Computer Graphics	<b>√</b>	✓	✓	✓						
3rd Level	CS352	Image Processing	<b>√</b>	<b>√</b>	✓	<b>√</b>	✓					
	CS381	Software Development and Professional Practice	✓	✓	✓	✓	✓	✓				
	CS391	Software Engineering	<b>√</b>	<b>√</b>	<b>V</b>	<b>√</b>	✓	<b>√</b>				
	IS321	Advanced Project Management	✓									
	IT311	Network Security	✓	✓	<b>V</b>	✓	✓	✓	✓			

					_		1						
	IT331	Network Management	•	<b>V</b>	•	•							
	IT351	Computer Networks	✓	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>				
	IT361	Field Training	✓	✓	✓	✓	<b>√</b>						
	IT371	Web Programming	✓	<b>√</b>	✓	✓	<b>√</b>						
	MM301	Introduction to Multimedia Technology	✓	✓	✓	✓	<b>√</b>	<b>√</b>	✓				
	MATH301	Numerical Analysis	✓	✓	✓	<b>✓</b>	<b>✓</b>	<b>✓</b>	<b>✓</b>				
	IT431	Wireless and Mobile Computing	✓	✓	✓	✓	<b>√</b>						
	IT451	Network Analysis and Design	✓	✓	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓				
	IT432	Network Programming	✓	✓	<b>√</b>	✓	<b>√</b>						
	IT441	Enterprise Architecture	✓	✓	<b>√</b>	✓	<b>√</b>	<b>√</b>					
	IT471	E-commerce	✓	<b>√</b>	✓								
	IT433	Network Forensics	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>				
	IT452	Networked Embedded Systems	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>✓</b>						
	IT461	Capstone Project I	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>✓</b>						
rel	IT462	Capstone Project II	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>✓</b>						
4th Level	CS451	Computer Animation	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>✓</b>	<b>√</b>					
4€	CS431	Parallel Computation	✓	<b>✓</b>	✓	✓							
	CS452	Computer Vision	✓	<b>✓</b>	<b>√</b>								
	CS461	Intelligent Systems	✓	<b>✓</b>	<b>√</b>	<b>√</b>							
	IS411	Advanced Database	<b>√</b>	<b>√</b>									
	IS412	Distributed and Object Databases	✓	<b>√</b>									
	MM402	Virtual Reality	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>✓</b>	<b>✓</b>					
	CE421	Advanced Computer Architecture	✓	✓	<b>√</b>	✓	<b>√</b>	<b>√</b>					
	CE422	Embedded Systems	✓	<b>√</b>	✓	✓	<b>✓</b>						
			c1	c2	сЗ	c4	c5	с6	с7	c8	с9	c10	C11

## Program Matrix VI (Courses - Transferable Skills)

	Code	Course	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12
	CS141	Programming Fundamentals	✓	✓	~	✓	✓							
	IT101	IT Fundamentals	✓	<b>√</b>	<b>√</b>	<b>√</b>								
el la	MATH101	Mathematics I	✓		<b>√</b>									
Level	MATH102	Mathematics II	✓		<b>√</b>									
$1^{st}$	PHYS101	Physics I	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓						
	PHYS102	Physics II	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓						
	EE101	Electronics	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓						

	EE102	Digital Circuits	<b>~</b>	✓	<b>√</b>	<b>√</b>	<b>✓</b>						
	HUM111	English Language I	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>				
	HUM112	English Language II	✓	✓	✓	✓	✓	✓	<b>√</b>				
	HUM121	Social Context of Computing	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓	✓	✓	<b>√</b>		
	HUM122	Intellectual Property	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓	✓				
	HUM131	Organizational Behavior	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓	<b>√</b>				
	HUM132	Interpersonal Communication	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	HUM133	Computing Economics	✓	✓	✓	<b>√</b>	<b>√</b>	✓	<b>√</b>				
	HUM141	Computer Law	<b>√</b>	✓	✓	✓							
	HUM142	Privacy and Civil Liberties	<b>√</b>	✓	✓								
	HUM151	Hand Drawing	<b>√</b>	✓	✓								
	HUM152	History of Computing	<b>√</b>	✓	✓								
	HUM153	Islamic Culture		✓	✓								
	HUM154	Scientific Thinking	<b>√</b>	✓	✓								
	CS201	Discrete Structures	✓	✓	✓	✓							
	CS211	Data Structures and Algorithms	<b>√</b>	✓	✓	✓	✓	✓					
	CS241	Object-Oriented Programming	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓					
	IS201	Foundations of Information Systems			✓	✓	✓	✓					
	IS211	File Organization	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>					
	IS212	Databases	<b>√</b>		<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>					
	IS221	Project Management		✓	✓	<b>√</b>	<b>√</b>	✓					
evel	IS231	Systems Analysis and Design	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓	<b>√</b>	✓			
2nd Level	IT251	Data Communications	<b>√</b>	✓	✓	✓	✓	✓					
	CE221	Computer Architecture	<b>√</b>	✓	✓	<b>√</b>							
	MATH201	Mathematics III	<b>√</b>	✓	✓	<b>√</b>							
	MATH202	Probability and Statistics	<b>√</b>	✓	✓								
	EE201	Digital Signal Processing	<b>√</b>	✓	<b>√</b>	<b>√</b>							
	HUM231	Business Administration	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>				
	HUM232	Technical Writing	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>	✓	<b>√</b>		
	HUM241	Computers and Ethics	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓	<b>√</b>				
	CS301	Operation Research											
evel	CS302	Simulation and Modeling	<b>√</b>		✓								
3rd Level	CS321	Operating Systems	<b>√</b>	✓									
	CS341	Visual Programming	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓					

	CS351	Computer Graphics	✓	✓	<b>✓</b>	<b>✓</b>	<b>√</b>	<b>✓</b>						
	CS352	Image Processing	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓						
	CS381	Software Development and Professional Practice	<b>√</b>	✓	<b>√</b>	✓	<b>√</b>	<b>√</b>						
	CS391	Software Engineering	✓	✓	✓	✓	✓	✓						
	IS321	Advanced Project Management	✓											
	IT311	Network Security	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓						
	IT331	Network Management	✓	✓	✓	✓	✓	✓						
	IT351	Computer Networks	✓	✓	✓	✓	✓	✓	✓	✓	<b>V</b>			
	IT361	Field Training	✓	✓	<b>√</b>	✓	<b>√</b>	✓	✓	✓	<b>√</b>	✓	✓	
	IT371	Web Programming	✓	✓	<b>√</b>	✓	<b>√</b>	✓	✓					
	MM301	Introduction to Multimedia Technology	<b>√</b>	✓	<b>√</b>	·	✓	✓	✓	✓	<b>√</b>			
	MATH301	Numerical Analysis	✓	✓	<b>√</b>	<b>√</b>	✓	<b>√</b>	✓					
	IT431	Wireless and Mobile	✓	✓	✓	✓	<b>√</b>	✓	✓					
	IT451	Computing Network Analysis and Design	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>					
	IT432	Network Programming	✓	✓	✓	✓	✓	✓	✓					
	IT441	Enterprise Architecture	✓	✓	✓	✓	✓							
	IT471	E-commerce	✓	✓	✓	✓	✓	✓	✓					
	IT433	Network Forensics	✓	✓	✓	✓								
	IT452	Networked Embedded Systems	✓	✓	✓	✓	✓	✓						
	IT461	Capstone Project I	✓	✓	✓	✓	✓	✓	✓	✓	<b>√</b>	✓	<b>√</b>	
vel	IT462	Capstone Project II	✓	✓	✓	✓	✓	✓	✓	✓	<b>√</b>	✓	✓	
4 <sup>th</sup> Level	CS451	Computer Animation	✓	✓	<b>√</b>	✓								
4	CS431	Parallel Computation	✓	✓	<b>√</b>	✓								
	CS452	Computer Vision	✓	✓	✓	✓	✓							
	CS461	Intelligent Systems	✓	✓	<b>√</b>	✓								
	IS411	Advanced Database	✓	✓	<b>√</b>	✓	✓	✓						
	IS412	Distributed and Object Databases	<b>√</b>	✓	<b>V</b>	✓	<b>√</b>	<b>√</b>						
	MM402	Virtual Reality	✓	✓	✓	✓	✓	✓						
	CE421	Advanced Computer Architecture	<b>√</b>	✓	<b>√</b>	✓	<b>√</b>							
	CE422	Embedded Systems	✓	✓										
			d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12

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

	MATH202	Probability and Statistics	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>								✓		T		
	EE201	Digital Signal Processing	<b>√</b>	✓	✓										✓		T	T	
	HUM231	Business Administration	<b>√</b>	<b>√</b>											✓		$\dagger$	T	
	HUM232	Technical Writing	<b>√</b>	✓	✓										✓		T	T	٦
	HUM241	Computers and Ethics	~	✓											<b>√</b>		T	T	
	CS301	Operation Research	✓		✓	✓	<b>√</b>	<b>√</b>							✓		T	T	T
	CS302	Simulation and Modeling	✓	✓	✓	<b>√</b>									✓		T	T	
	CS321	Operating Systems	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>V</b>					✓		T	T	
	CS341	Visual Programming	✓	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>							✓			T	
	CS351	Computer Graphics	✓	✓	✓	<b>√</b>	<b>√</b>	<b>~</b>	✓						✓			T	٦
	CS352	Image Processing	<b>√</b>	✓	✓	✓	<b>√</b>	✓	<b>√</b>	✓					✓				
	CS381	Software Development and Professional Practice	✓		✓	✓				V		✓			✓				
evel	CS391	Software Engineering	<b>√</b>	✓	✓	<b>✓</b>	<b>√</b>	✓	<b>✓</b>	<b>√</b>	<b>V</b>	✓			✓				
3rd Level	IS321	Advanced Project Management	<b>√</b>	✓											✓				
	IT311	Network Security	✓	✓	✓	<b>√</b>	<b>√</b>	✓	<b>V</b>	<b>√</b>					✓				
	IT331	Network Management	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓	✓						✓				✓
	IT351	Computer Networks	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓			✓				
	IT361	Field Training	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>V</b>	<b>√</b>				✓				✓
	IT371	Web Programming	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>V</b>					✓				
	MM301	Introduction to Multimedia Technology	<b>√</b>	✓	✓										✓				
	MATH301	Numerical Analysis	<b>^</b>	<b>√</b>	<b>✓</b>										✓				
	IT431	Wireless and Mobile Computing	<b>√</b>	✓	✓	<b>√</b>			✓	✓	<b>√</b>				✓		Τ	T	
	IT451	Network Analysis and Design	~	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>V</b>	<b>V</b>	✓			✓			T	
	IT432	Network Programming	~	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>V</b>	<b>V</b>				✓			T	
	IT441	Enterprise Architecture	~	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>							✓			T	
	IT471	E-commerce	✓	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>							✓		T	T	
15	IT433	Network Forensics	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>V</b>	<b>V</b>	✓	✓	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓
4th Level	IT452	Networked Embedded Systems	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	~	<b>√</b>						✓		$\dagger$	$\dagger$	
4 <sup>th</sup>	IT461	Capstone Project I	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	~	<b>√</b>	~	<b>V</b>				✓		$\dagger$	$\dagger$	
	IT462	Capstone Project II	~	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>V</b>	<b>V</b>				✓		$\dagger$	†	
	CS451	Computer Animation	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>								<b>√</b>		$\dagger$	†	
	CS431	Parallel Computation	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	V	<b>V</b>	~				<b>√</b>		$\dagger$	†	
	CS452	Computer Vision	~	✓	✓										✓	$\dagger$	$\dagger$	†	
	CS461	Intelligent Systems	<b>√</b>	✓	✓	<b>√</b>									✓		1		

IS411	Advanced Database	✓	<b>√</b>	<b>√</b>	1									✓				
IS412	Distributed and Object Databases	✓	✓	✓										✓				
MM402	Virtual Reality	✓	✓	✓	✓									✓				
CE421	Advanced Computer Architecture	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>							✓				
CE422	Embedded Systems	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>					✓				
		a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16	a17

	CS141 IT101 MATH101	Programming Fundamentals  IT Fundamentals	<b>√</b>	✓	<b>√</b>	<b>√</b>	1					b10		i			
		IT Fundamentals				ľ											
	MATH101	TI FUNDAMENTAIS	~	<b>√</b>	<b>√</b>												
		Mathematics I	<b>V</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>									
	MATH102	Mathematics II	<b>V</b>	<b>√</b>	<b>✓</b>	<b>√</b>	<b>✓</b>	<b>√</b>									
	PHYS101	Physics I	<b>V</b>	✓	<b>√</b>	<b>√</b>											
	PHYS102	Physics II	<b>V</b>	✓	<b>√</b>	<b>√</b>											
	EE101	Electronics	~	✓	<b>√</b>	✓	<b>√</b>	✓									
	EE102	Digital Circuits	<b>√</b>	✓	✓	✓	<b>√</b>	✓									
	HUM111	English Language I	<b>√</b>	✓													
	HUM112	English Language II	<b>√</b>	✓	<b>√</b>												
1st Level	HUM121	Social Context of Computing	<b>√</b>	✓	<b>√</b>												
1st I	HUM122	Intellectual Property	<b>√</b>	✓	✓												
	HUM131	Organizational Behavior	~	✓													
	HUM132	Interpersonal Communication	<b>√</b>	✓	<b>√</b>												
	HUM133	Computing Economics	<b>~</b>	<b>✓</b>	<b>✓</b>	✓	<b>√</b>										
	HUM141	Computer Law	✓	✓	✓	✓											
	HUM142	Privacy and Civil Liberties	<b>√</b>	✓	<b>√</b>	✓											
	HUM151	Hand Drawing	<b>V</b>			✓											
	HUM152	History of Computing	<b>V</b>	✓	<b>√</b>												
	HUM153	Islamic Culture		✓	<b>√</b>												
	HUM154	Scientific Thinking	<b>√</b>	✓													
	CS201	Discrete Structures	<b>√</b>	✓	<b>√</b>	✓	<b>√</b>	✓									
	CS211	Data Structures and Algorithms	~	<b>√</b>			✓	<b>√</b>									
2nd Level	CS241	Object-Oriented Programming	<b>V</b>	✓	<b>√</b>	✓	<b>√</b>										
2 <sup>nd</sup> ]	IS201	Foundations of Information Systems	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>				✓	
	IS211	File Organization	<b>√</b>	✓	<b>√</b>	✓											

	IS212	Databases	<b>√</b>	✓	✓	<b>√</b>	✓												
	IS221	Project Management	✓																
	IS231	Systems Analysis and Design	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓	✓	✓	✓			<b>√</b>	✓	<b>√</b>	<b>√</b>	✓		✓
	IT251	Data Communications	<b>√</b>	✓	✓	✓	✓												
	CE221	Computer Architecture	<b>√</b>	✓	✓	<b>√</b>													
	MATH201	Mathematics III	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>												
	MATH202	Probability and Statistics	✓	✓	✓	<b>√</b>	✓	✓											
	EE201	Digital Signal Processing	✓	✓	✓	<b>√</b>	✓												
	HUM231	Business Administration	<b>√</b>	✓	<b>√</b>														
	HUM232	Technical Writing	<b>√</b>	✓	<b>√</b>														
	HUM241	Computers and Ethics	<b>√</b>		<b>√</b>														
	CS301	Operation Research	✓	✓	✓														
	CS302	Simulation and Modeling	<b>√</b>	✓	<b>√</b>	<b>√</b>													
	CS321	Operating Systems	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓												
	CS341	Visual Programming	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>												
	CS351	Computer Graphics	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓	✓											
	CS352	Image Processing	✓	✓	<b>√</b>	<b>√</b>	<b>V</b>												
	CS381	Software Development and Professional Practice	<b>✓</b>	✓	<b>√</b>	✓	✓	✓	✓	✓	✓	✓	✓						
vel	CS391	Software Engineering	✓	✓	✓	<b>√</b>	V	<b>√</b>	✓	<b>√</b>	✓	✓	✓	✓	✓	<b>√</b>	✓	✓	✓
3rd Level	IS321	Advanced Project Management	<b>√</b>																
(4)	IT311	Network Security	✓	✓	<b>√</b>	<b>√</b>	✓	<b>√</b>	✓	<b>√</b>	<b>√</b>								
	IT331	Network Management	✓	✓															
	IT351	Computer Networks	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓												
	IT361	Field Training	✓	✓	✓	<b>√</b>	V	<b>√</b>	✓	<b>√</b>	✓	✓	✓	✓	✓	<b>√</b>	✓	✓	✓
	IT371	Web Programming	✓	✓	✓														
	MM301	Introduction to Multimedia Technology	✓	✓	<b>√</b>	<b>√</b>													
	MATH301	Numerical Analysis	✓	✓	<b>√</b>	<b>√</b>	✓	✓											
	IT431	Wireless and Mobile Computing	✓	✓	<b>√</b>	<b>√</b>	✓	<b>√</b>											
	IT451	Network Analysis and Design	✓	✓	<b>√</b>	<b>√</b>	✓	✓	✓	✓	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>			✓	✓
el	IT432	Network Programming	✓	✓	<b>√</b>	<b>~</b>	✓	✓											
4th Level	IT441	Enterprise Architecture	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>												
4 <sup>th</sup>	IT471	E-commerce	<b>√</b>	✓															
	IT433	Network Forensics	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>										
	IT452	Networked Embedded Systems	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓												

IT461	Capstone Project I	<b>√</b>	✓	✓	<b>V</b>	<b>\</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	<b>√</b>
IT462	Capstone Project II	<b>√</b>	<b>√</b>	✓	<b>V</b>	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓	✓	✓	✓	✓	✓	✓	✓
CS451	Computer Animation	<b>√</b>	<b>√</b>	✓															
CS431	Parallel Computation	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>													
CS452	Computer Vision	<b>√</b>	<b>√</b>	✓	<b>V</b>														
CS461	Intelligent Systems	<b>√</b>	<b>√</b>	✓															
IS411	Advanced Database	<b>√</b>	<b>√</b>	✓	~	~	<b>√</b>												
IS412	Distributed and Object Databases	<b>√</b>	✓				✓												
MM402	Virtual Reality	✓		✓		<b>√</b>													
CE421	Advanced Computer Architecture	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>													
CE422	Embedded Systems	<b>√</b>	✓	✓	<b>✓</b>	<b>√</b>													
		b1	b2	Ь3	b4	b5	b6	b7	b8	Ъ9	b10	b11	b12	b13	b14	b15	b16	b17	b18

	Code	Course	c1	c2	сЗ	c4	с5	с6	c7	c8	с9	c10	C11
	CS141	Programming Fundamentals											
	IT101	IT Fundamentals	~	<b>V</b>	~	<b>√</b>							
	MATH101	Mathematics I	~	<b>V</b>	~								
	MATH102	Mathematics II	~	~	~	✓							
	PHYS101	Physics I	~	~	~	✓	<b>√</b>	<b>V</b>					
	PHYS102	Physics II	~	~	<b>√</b>	<b>√</b>	✓						
	EE101	Electronics	~	<b>V</b>	<b>V</b>	<b>√</b>	✓						
	EE102	Digital Circuits	~	<b>1</b>	~	✓	✓						
	HUM111	English Language I											
[e]	HUM112	English Language II	~	<b>1</b>	<b>√</b>								
1st Level	HUM121	Social Context of Computing	<b>V</b>	<b>1</b>	<b>√</b>								
1°	HUM122	Intellectual Property											
	HUM131	Organizational Behavior	~	<b>1</b>	<b>1</b>								
	HUM132	Interpersonal Communication											
	HUM133	Computing Economics	~	<b>1</b>	~								
	HUM141	Computer Law	~		<b>✓</b>								
	HUM142	Privacy and Civil Liberties	$\top$	~	<b>✓</b>								
	HUM151	Hand Drawing	~	<b>1</b>	<b>✓</b>								
	HUM152	History of Computing	~	<b>V</b>									
	HUM153	Islamic Culture	~		~								

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

IT451	Network Analysis and Design	<b>√</b>	✓	✓	✓	✓	<b>√</b>	✓				
IT432	Network Programming	✓	✓	✓	<b>√</b>	✓						
IT441	Enterprise Architecture	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>					
IT471	E-commerce	✓	✓	<b>√</b>								
IT433	Network Forensics	<b>√</b>	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>				
IT452	Networked Embedded Systems	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	✓						
IT461	Capstone Project I	✓	✓	✓	<b>√</b>	✓						
IT462	Capstone Project II	<b>√</b>	✓	✓	<b>√</b>	✓						
CS451	Computer Animation	✓	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>					
CS431	Parallel Computation	✓	✓	<b>√</b>	<b>√</b>							
CS452	Computer Vision	✓	✓	<b>√</b>								
CS461	Intelligent Systems	✓	✓	<b>√</b>	<b>√</b>							
IS411	Advanced Database	✓	✓									
IS412	Distributed and Object Databases	✓	✓									
MM402	Virtual Reality	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>					
CE421	Advanced Computer Architecture	✓	✓	<b>√</b>	<b>√</b>	✓	<b>√</b>					
CE422	Embedded Systems	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>						
		c1	c2	сЗ	c4	с5	с6	c7	с8	с9	c10	C11

	Cada	Carrea	11	10	10	1.4	15	10	107	10	10	110	144	110
_	Code	Course	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	dII	d12
	CS141	Programming Fundamentals												
	IT101	IT Fundamentals	✓	✓	<b>V</b>	<b>√</b>								
	MATH101	Mathematics I	✓		<b>V</b>									
	MATH102	Mathematics II	✓		<b>V</b>									
	PHYS101	Physics I	✓	✓	<b>V</b>	<b>V</b>	✓	<b>V</b>						
	PHYS102	Physics II	✓	✓	<b>V</b>	<b>V</b>	✓	<b>V</b>						
	EE101	Electronics	✓	✓	<b>V</b>	<b>V</b>	✓	<b>V</b>						
1st Level	EE102	Digital Circuits	✓	✓	~	<b>√</b>	✓							
1st ]	HUM111	English Language I												
	HUM112	English Language II	✓	✓	~	~	✓	~	~					
	HUM121	Social Context of Computing	✓	✓	~	✓	✓	<b>V</b>	~	<b>√</b>	✓			
	HUM122	Intellectual Property												
	HUM131	Organizational Behavior	✓	✓	~	<b>√</b>	✓	<b>*</b>	~					
	HUM132	Interpersonal Communication												
	HUM133	Computing Economics	✓	✓	<b>V</b>	<b>✓</b>	✓	<b>V</b>						

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

	IT361	Field Training	✓	<b>V</b>	<b>✓</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>~</b>	<b>√</b>	✓	✓	<b>√</b>	
	IT371	Web Programming	✓	<b>√</b>	✓	<b>√</b>	✓	✓	<b>√</b>					
	MM301	Introduction to Multimedia Technology	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	✓	<b>√</b>	<b>√</b>	✓			
	MATH301	Numerical Analysis	✓	<b>√</b>	✓	<b>√</b>	✓	✓	<b>√</b>					
	IT431	Wireless and Mobile Computing	✓	<b>√</b>	✓	✓	✓	✓	✓					
	IT451	Network Analysis and Design	✓	<b>√</b>	✓	<b>√</b>	✓	✓	<b>√</b>					
	IT432	Network Programming	✓	<b>√</b>	✓	<b>√</b>	✓	✓	<b>√</b>					
	IT441	Enterprise Architecture	✓	<b>√</b>	✓	<b>√</b>	✓							
	IT471	E-commerce	✓	<b>√</b>	✓	<b>√</b>	✓	✓	<b>√</b>					
	IT433	Network Forensics	✓	<b>√</b>	✓	<b>√</b>								
	IT452	Networked Embedded Systems	✓	<b>√</b>	✓	<b>√</b>	✓	✓						
	IT461	Capstone Project I	✓	<b>√</b>	✓	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓	✓	<b>√</b>	
vel	IT462	Capstone Project II	✓	<b>√</b>	✓	<b>√</b>	✓	✓	<b>√</b>	<b>√</b>	✓	✓	<b>√</b>	
4th Level	CS451	Computer Animation	✓	~	<b>√</b>	<b>√</b>								
4	CS431	Parallel Computation	✓	<b>√</b>	<b>√</b>	<b>√</b>								
	CS452	Computer Vision	✓	<b>√</b>	<b>√</b>	<b>√</b>	✓							
	CS461	Intelligent Systems	✓	<b>√</b>	<b>√</b>	<b>√</b>								
	IS411	Advanced Database	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>						
	IS412	Distributed and Object Databases	✓	<b>✓</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>						
	MM402	Virtual Reality	✓	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>						
	CE421	Advanced Computer Architecture	<b>√</b>	<b>V</b>	<b>√</b>	<b>√</b>	<b>√</b>							
	CE422	Embedded Systems	✓	<b>√</b>										
			d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12

Program Matrix VII (Aims - ILOs)

			Teac	_	and etho		ning	
In	tended Learning Outcomes (ILO's) of the program	Lecture	Tutorials exercises	Practical exercises	Workshops	Projects	Case study	Data collection
	a.1) Demonstrate basic knowledge and understanding of fundamental principles of computer architectures and operating systems and how these support IT-based applications.	<b>√</b>	<b>✓</b>				<b>√</b>	<b>✓</b>
	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.	<b>√</b>	<b>√</b>	<b>√</b>		<b>√</b>	<b>√</b>	<b>✓</b>
	a.3) Demonstrate strong knowledge of fundamentals of programming and the construction of data structures and algorithms.	<b>√</b>	<b>√</b>	<b>√</b>		✓		
ding	a.4) Demonstrate strong knowledge of fundamentals of programming and the construction of computer-based systems, software engineering techniques and information retrieval.	✓	✓	✓		✓		
tan	a.5) Show a critical understanding of the theory and methods of systems analysis and design.	✓	✓				<b>√</b>	
d Unders	a.6) Show a critical understanding of technologies for the design, development and management of multiuser database systems and the implementation of database systems and information retrieval systems.	<b>✓</b>	<b>✓</b>	<b>√</b>		<b>√</b>	<b>√</b>	<b>✓</b>
Knowledge and Understanding	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.	<b>✓</b>	<b>✓</b>	<b>√</b>		✓	✓	
Z	a.8) Know methods for the construction of web-based systems, design of internet-based systems.	✓	<b>✓</b>			<b>√</b>	✓	
	a.9) Provide a deeper understanding of legal, professional and moral aspects of the exploitation of IT.	<b>✓</b>			<b>√</b>		✓	<b>✓</b>
	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.	<b>√</b>			<b>√</b>		✓	<b>✓</b>
	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.	<b>√</b>	<b>√</b>	<b>√</b>		<b>√</b>	<b>√</b>	

			Teac	_	and etho	Lear ds	ning	
In	tended Learning Outcomes (ILO's) of the program	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.	<b>√</b>	✓	<b>√</b>		✓	✓	<b>√</b>
	a.13) Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.	<b>√</b>	✓					
	a.14) Know the principles and techniques of a number of application areas informed by the research directions of IT areas.	<b>✓</b>		<b>✓</b>	<b>✓</b>		<b>✓</b>	
	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.	✓	✓	✓		<b>√</b>	<b>√</b>	
	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>✓</b>		<b>√</b>	✓	
<u>x</u>	b.3) Summarize the proposed solutions ad their results.			<b>∨</b>		<b>✓</b>		
Kil	b.4) Restrict solution methodologies upon their results.			<b>✓</b>		<b>∨</b>	<b>√</b>	
<u>S</u>	<ul><li>b.5) Establish criteria, and verify solutions.</li><li>b.6) Identify a range of solutions and critically evaluate</li></ul>					· ·	<b>–</b>	
lal	and justify proposed design solutions.		✓	✓				
Intellectual Skills	b.7) Solve information technology problems with pressing commercial or industrial constraints.			<b>✓</b>		<b>√</b>	<b>√</b>	
Inte	b.8) Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.			<b>√</b>		<b>√</b>		
	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    b_111				Teaching and Learning Methods								
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.  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 risks or safety aspects involved in the operation of computer-based systems.  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			Lecture	Tutorials exercises	Practical exercises	Workshops	Projects	Case study	Data collection			
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.  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		issues involved in the exploitation of Information Technology and be guided by their adoption, reflect on issues of professional practice within the	<b>√</b>			<b>√</b>		<b>√</b>				
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.  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		practices underpinning computing as an academic		✓	✓	✓		✓				
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.  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		b.13) Define criteria to measure the appropriateness of a computer system for its current deployment and future evolution, and to interpret the results		<b>√</b>	<b>√</b>		<b>√</b>					
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.  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		processes taking into account limitations, constraints, fit-for-purpose, general quality, and possible trade-offs within the parameters of the	<b>√</b>	✓				<b>√</b>				
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.  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		effectively using rational and reasoned arguments		<b>✓</b>	✓		✓					
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.  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		b.16) Generate the results of tests to investigate the			✓	✓	✓	✓				
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		balanced costs, benefits, safety, quality, reliability,	<b>√</b>	<b>√</b>		<b>√</b>		<b>√</b>				
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			<b>✓</b>	<b>√</b>		<b>√</b>			<b>√</b>			
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		develop computer-based systems using	<b>✓</b>	<b>√</b>	<b>√</b>		<b>√</b>	<b>√</b>				
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	w <sub>0</sub>	possible trade-offs, evaluate appropriate hardware and software solutions for given	✓	✓		✓			<b>√</b>			
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	Skill	operation of computer-based systems.	<b>✓</b>	✓				✓				
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	Professional	and documentation of computer-based systems.	<b>√</b>	✓	✓							
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		into account its logical and physical properties.			<b>√</b>		<b>√</b>					
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		ethical issues within the discipline.										
novel aspects of their work  c.9) Make effective use of general IT facilities, plan		aspects of Information Technology.		<b>√</b>				<b>√</b>				
		novel aspects of their work	<b>√</b>	<b>✓</b>					·			

			Teaching and Learning Methods								
Intended Learning Outcomes (ILO's) of the program		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.	<b>✓</b>			<b>√</b>			✓			
	c.11) Apply tools and techniques for the design and development of applications and projects.		✓	✓		✓		<b>✓</b>			
	d.1) Collaborate effectively within multidisciplinary team. d.2) Work in stressful environment and within constraints.		✓	<b>√</b>		✓ ✓					
	d.3) Communicate effectively.		<b>√</b>	<b>√</b>							
	d.4) Demonstrate efficient IT capabilities.		✓	✓	✓	✓					
	d.5) Lead and motivate individuals.		<b>✓</b>			✓					
	d.6) Manage tasks and resources.		✓	✓		✓					
ills	d.7) Search for information and adopt life-long self-learning.		✓	✓		✓		✓			
I Sk	d.8) Work as part of a development team and to recognize the different roles of its members.			✓	✓	✓					
General Skills	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.		✓	✓		<b>√</b>		<b>✓</b>			
	d.10) Work independently and as part of a team with minimum guidance.			<b>√</b>	✓	<b>√</b>					
	d.11) Prepare their work in the form of reports, oral presentations or an internet web site.		<b>√</b>	<b>√</b>		<b>√</b>					
	d.12) Exhibit appropriate numeracy skills in understanding and presenting cases involving a quantitative dimension.		<b>√</b>	<b>√</b>							

## 2- ASSESMENT METHODS

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

Intended Learning Outcomes (ILO's) of the program		Assessment methods					
		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.	<b>✓</b>	<b>✓</b>	<b>✓</b>	<b>√</b>			
a.3) Demonstrate strong knowledge of fundamentals of programming	<b>√</b>	✓	<b>✓</b>	<b>√</b>			
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.	<b>✓</b>	<b>√</b>	<b>√</b>	<b>√</b>			
a.5) Show a critical understanding of the theory and methods of	<b>√</b>	<b>√</b>		<b>√</b>			
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.	<b>√</b>	<b>√</b>	<b>√</b>	✓			
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.	<b>√</b>	<b>√</b>	<b>√</b>	✓			
a.8) Know methods for the construction of web-based systems, design of internet-based systems.	<b>✓</b>	<b>√</b>	✓	✓			
a.9) Provide a deeper understanding of legal, professional and moral aspects of the exploitation of IT.	<b>✓</b>	<b>✓</b>		✓			
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.	<b>✓</b>	<b>✓</b>		<b>✓</b>			
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.	<b>✓</b>	<b>√</b>	<b>✓</b>	<b>√</b>			
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.	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>			
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.	<b>√</b>	<b>√</b>		✓			
a.15) Describe the tools, practices and methodologies used in the specification, design, implementation and critical evaluation of computer software systems.	<b>✓</b>	<b>✓</b>	<b>√</b>	✓			
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.	<b>✓</b>	<b>√</b>	<b>√</b>	<b>√</b>			
a.17) Know the principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.	<b>✓</b>	✓	✓	✓			

			Assessment methods					
	Intended Learning Outcomes (ILO's) of the program	Final Exam	Mid-Term Exam	Practical Exam	Class Work	Oral Exam		
	b.1) Define traditional and nontraditional information technology systems problems, set goals towards solving them, observe results, reason and apply judgment.	<b>√</b>	<b>√</b>		✓			
	b.2) Identify attributes, components, relationships, patterns, main ideas, and errors.	✓	✓		✓			
	b.3) Summarize the proposed solutions ad their results.	<b>√</b>	<b>√</b>		<b>√</b>			
	b.4) Restrict solution methodologies upon their results.	<b>√</b>	<b>√</b>		<b>√</b>			
	b.5) Establish criteria, and verify solutions.	<b>√</b>	✓		✓			
	b.6) Identify a range of solutions and critically evaluate and justify proposed design solutions.	✓	✓		✓			
	<ul><li>b.7) Solve information technology problems with pressing commercial or industrial constraints.</li><li>b.8) Generate an innovative design to solve a problem containing a</li></ul>	<b>√</b>	<b>√</b>		✓			
	range of commercial and industrial constraints.  b.9) Perform problem analysis from written descriptions; derive	<b>√</b>	<b>√</b>		<b>√</b>			
cills	requirements specifications from an understanding of problems (analysis, synthesis).	✓	✓		<b>√</b>			
al Sk	b.10) Create and/or justify designs to satisfy given requirements (synthesis, evaluation, application).	✓	✓	✓	✓			
Intellectual Skills	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>✓</b>	<b>✓</b>	✓			
In	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>✓</b>	<b>✓</b>		>			
	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>√</b>	✓		<b>√</b>			
	<ul><li>b.18) Read research papers in a range of knowledge areas.</li><li>c.1) Specify, investigate, analyze, design and develop computer-</li></ul>				<b>√</b>			
Professional Skills	based systems using appropriate tools and techniques.  c.2) Evaluate systems in terms of their quality and possible trade-	<b>√</b>	<b>√</b>	<b>√</b>	<b>√</b>			
	offs, evaluate appropriate hardware and software solutions for given scenarios.	✓	<b>✓</b>		<b>✓</b>			
	c.3) Recognize risks or safety aspects involved in the operation of computer-based systems.	✓	<b>✓</b>		✓			
	c.4) Effectively deploy tools for the implementation and documentation of computer-based systems.			✓	✓			
P	c.5) Operate computing equipment efficiently, taking into account its logical and physical properties.			✓	✓			

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

**Program Coordinator:** Prof. Hosny M. Ibrahim

Signature:

**Approved by the Dean:** Prof.Adel A.swisy

Signature: