

Software Engineering Undergraduate Program 2017-2018



**Faculty of
Computers and Information**

Dept. of Computer Science





Assiut University

Faculty of Computers &
Information

**Software Engineering
Undergraduate Program**

(Credit Hours System)

2017 – 2018



Assiut University
Faculty of Computers & Information
Department of Computer Science
Quality Assurance Unit



SE Undergraduate Program

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SE Undergraduate Program Specifications

A. Basic Information

1. **Program Title:** Software Engineering
2. **Program Type:** Single
3. **Faculty (Faculties):** Faculty of Computers and Information
4. **Department:** Computer Science
5. **Assistant Coordinator:** Dr. Mamdouh Farouk
6. **Coordinator:** Prof. Khaled F. Hussain
7. **Date of program specifications approval:** 2017- 2018

B. Professional Information

1. Program Aims

Since the dawn of computing in the 1940s, the applications and uses of computers have grown at a staggering rate. Software plays a central role in almost all aspects of daily life. The number, size, and application domains of computer programs have grown dramatically; as a result, hundreds of billions are being spent on software development, and the livelihood and lives of most people depend on the effectiveness of this development. Despite these successes, there are serious problems in the cost, timeliness, and quality of many software products. The reasons for these problems are many and include the following:

- ☐ Software products are among the most complex of man-made systems, and software by its very nature has intrinsic, essential properties (e.g., complexity, invisibility, and changeability) that are not easily addressed.
- ☐ Programming techniques and processes that worked effectively for an individual or a small team to develop modest-sized programs do not scale-up well to the development of large, complex systems (i.e., systems with millions of lines of code, requiring years of work, by hundreds of software developers).
- ☐ The pace of change in computer and software technology drives the demand for new and evolved software products. This situation has created customer expectations and competitive forces that strain our ability to produce quality of software within acceptable development schedules.

2. Graduate attributes

After successfully completing the Software Engineering program, the graduate should be able to:

- Recognize problems that are amenable to software engineering, and knowledge of the tools necessary for solving such problems.
- Understand basics of software development life cycle (SDLC), design and analysis, information security, data mining, and crisis management.

- Understand and apply a wide range of principles and tools of software engineering, such as design methodologies, choice of algorithm, language, software libraries, and user interface techniques.
- Implement solutions using appropriate programming languages, web-based systems and tools, design methodologies, and database systems.
- Design, implement, and evaluate a computer-based systems, process, component, or program.
- Use knowledge and understanding in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoff involved in design choices.
- Specify, design, and implement computer-based information systems, and evaluate them in terms of general quality attributes and possible tradeoffs presented within the given problem.
- Perform troubleshooting in software systems.
- Describe characteristics of various components of information systems, use the appropriate tools and techniques to analyze, design, and construct information systems.
- Communicate effectively and efficiency by oral, written, and visual means.
- Work effectively as an individual or as a member of a team in designing and implementing software systems.
- Perform independent and efficient time management.
- Analyze the local and global impact of computing on individuals, organizations, and society.
- Aware of key ethical issues affecting information systems and their responsibilities as information science professionals.
- Present effectively communicate ideas and concepts by oral, written, and visual means clearly and in an organized manner.

3. Intended Learning Outcomes (ILOs)

a. Knowledge and Understanding

The graduate should show a critical knowledge and understanding of:

- a1. Identify the essential facts, concepts, principles, and theories relating to basics of Mathematics.
- a2. Identify the basics, essential facts, concepts, principles, and theories relating to electronics for computer design.
- a3. List the basics of Management.
- a4. Know, understand, and describe the basics of Networking.
- a5. Recognize different Networks Designs.
- a6. Identify and understand the principles basics of software design.
- a7. Understand the design of components, objects and patterns.
- a8. Identify and understand the basics of database design.
- a9. Know and understand the principles of programming.
- a10. Classify problem solving techniques.
- a11. Describe software systems analysis.
- a12. Identify software systems design.
- a13. Describe legal, moral, and ethical aspects of software systems.
- a14. Explain Social impacts of software engineering.

- a15. Recognize, explain, predict, and manage individual and team behavior in organizations
- a16. Recognize tools for software engineering production and engineering
- a17. Describe Software quality assurance.
- a18. Recognize Software verifications and validation.
- a19. Understand the Security issues
- a20. Specify safety and environmental issues in software engineering.
- a21. Understand software project management fundamentals.
- a22. Clarify the fundamental concepts, principles, theories and results of mathematics relevant to computer science.
- a23. Identify theories, computability and computer programming languages.
- a24. Describe the principles and techniques of different application
- a25. Know and understand the principles and techniques of several application areas informed by the research directions of software engineering
- a26. Understand the complexity analysis of software and real time system
- a27. Understand concept of agile software engineering and its advantages in software development and recognize various agile methods such as Extreme Programming (XP) and Scrum.

Knowledge and understanding are developed through participation in lectures, tutorials, labs and workshops, directed and general reading, and primary and secondary search, e.g. using the Internet, library, etc

b. Intellectual Skills

- b1. Solve problems mathematically.
- b2. Model problems using programming and information technology.
- b3. Model problems using software engineering techniques.
- b4. Create and/or design software components, objects, and classes.
- b5. Collect the essential facts, concepts, principles, and theories relating to computer science and their relationship to one another.
- b6. Select appropriate solutions for problems in software design and development.
- b7. Analyze risks and economical aspects in the management of software projects.
- b8. Assess and evaluate the performance of software systems.
- b9. Solve the problems encountered in software design and production.
- b10. Apply computer science in solving problems with numerical tools constraints using recent development in computer technology.
- b11. Select appropriate tools and technologies used in software engineering.
- b12. Model the practical criteria and constraints in the adoption of the software systems in business environment.
- b13. Analyze the results of computational models.
- b14. Organize the crucial role of intellectual properties (IP) in organizations of different industrial sectors for the purposes of product and technology development
- b15. Revise activities and categorize IP infringements and the remedies available to the IP owner and describe the precautions steps to be taken to prevent infringement of proprietary rights in products and technology development
- b16. Estimate the quality and reliability of software systems.
- b17. Judge the environmental impact of the adoption of the software.
- b18. Analyze systems.
- b19. Apply inter-personal communication skills to diagnose and analyze organizational and behavioral problems and recommend appropriate courses of action
- b20. Perform comparisons between algorithm, methods, techniques... etc.
- b21. Perform classification of data, results, methods, techniques, algorithm ... etc.

- b22. Illustrate attributes, components, relationships, patterns, main ideas, and errors of the system
- b23. Investigate advanced tools in software engineering.

Intellectual skills are developed through successful completion of set assessment tasks, self-appraisal and self-evaluation, and critical evaluation of concepts, assumptions, arguments and data.

c. Professional and Practical Skills

At the end of the program, the graduate should be able to:

- c1. Use mathematics for solving problems and modeling solution.
- c2. Use programming and information technology concepts for solving problems.
- c3. Solve problems in software productions and adoption.
- c4. Analyze data.
- c5. Design test cases.
- c6. Use software tools in order to collect and interpret data.
- c7. Design and implement software solutions.
- c8. Use scientific literature and web resources effectively to perform appropriate technical presentations on ethical basis, and apply computer programs in numerical problems.
- c9. Apply software engineering principle in developing software projects.
- c10. Demonstrate effectively the tools used for the construction and documentation of software, with emphasis on understanding the whole process involved in using computers to solve practical problems.
- c11. Apply principles of safety and reliability in developing software.
- c12. Prepare technical materials.
- c13. Design the management software projects.
- c14. Consider the neatness and aesthetics in software design.
- c15. Specify, design, and implement computer-based system
- c16. Write user stories for project requirements and write test cases for developing features.

d. General and transferable skills

At the end of the program, the graduate should be able to:

- d1. Show Work efficiently in a team.
- d2. Work effectively as an individual and as a member of a team.
- d3. Communicate effectively.
- d4. Use IT tools efficiently.
- d5. Lead teamwork efficiently.
- d6. Take apart of manage tasks and resources.
- d7. Search for information independently.
- d8. Lead and motivate individuals.
- d9. Demonstrate critical thinking.
- d10. Show analytical thinking and the ability to solve problems.
- d11. Understand a new topic (self-learning).

Skills for life and work (general skills) are developed through working in groups to complete work set, such as presentations and projects, and managing time to complete assignments by deadlines.

4. Academic standards

4a. External references for standards

The academic standards invoked in this specification are driven based on the National Academic Reference Standards (NARS) for “Computing” approved by the National Authority of Quality Assurance and Accreditation of Education on October 2010.

4b. Comparison of provision to external references

See the attached document “Program Matrices”.

5. Curriculum Structure and Contents

5a. Program duration: 8 semesters.

5b. Program structure:

Total Credits: 144 credit hours

Mandatory Credits 100 credit hours

Elective Credits: 44 Credit hours

1- General Requirements (Humanities):

- 18 credit hours. (12.5%)
10 mandatory credit hours.

8 elective credit hours from the list of major elective courses

2- College Requirements:

- 70 credit hours (48.61%)
58 mandatory credit hours.
12 elective credit hours from the list of major elective courses

3- Major specialization Requirements:

- 42 credit hours (29.16%)
18 mandatory credit hours.
24 elective credit hours from the list of major elective courses.

4- Professional Training:

- 14 credit hours (9.72%)

6. Program Courses

I. Compulsory Courses

مقررات المواد الإنسانية (المتطلبات العامة)

Code	Course Name	Intended Learning Outcomes (ILOs)			
		Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
HUM111	English I			c12	d3, d7
HUM112	English II			c12	d3, d7
HUM121	Social Context of Computing	a1, a2	b1, b2	c1, c2, c3	d2
HUM122	Intellectual Property	a13, a14, a15	b14, b15	c8, c14	d4
HUM131	Organizational Behavior	a15	b9, b19	c12	d1, d2, d3, d5

HUM132	Interpersonal Communication		b19	c12	d1, d2, d3, d5
HUM133	Computing Economics	a16	b7, b17	c12	d1, d6
HUM141	Computer Law	a13		c12, C14	d3
HUM142	Privacy and Civil Liberties	a13	b14, b15	c8	d4, d7
HUM151	Hand Drawing	a1, a2	b1, b3	c2, C4	d4, d7
HUM152	History of Computing	a6, a7	b1,b2	c9,C11	d3, d6
HUM153	Islamic Culture	a13		c8	d8
HUM154	Scientific Thinking	a1, a2	b1,b2	c4	d1, d9, d10
HUM231	Business Administration	a3, a20, a21		c13	d2
HUM232	Technical Writing	a15, a18	b7, b13	c16	d2,d3
HUM241	Computers and Ethics	a13		c12, c14	d3

مقررات العلوم الأساسية

Code	Corse name	Intended Learning Outcomes (ILOs)			
		Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
MATH101	Mathematics I	a1	b1	c1	d9
MATH102	Mathematics II	a1	b1	c1	d9
MATH201	Mathematics III	a1	b1	c1	d10
MATH202	Probability and Statistics	a1	b1,b2	c1, c4	d9
MATH301	Numerical Analysis	a22, a23	b1, b10,b13	c1	d4
CS201	Discrete Structures	a1	b1	c1	d9
CS301	Operation Research	a1	b1, b7, b13	c1, c2	d1
CS302	Simulation and Modeling	a1	b2, b13	c1, c2, c4	d1
PHYS101	Physics I	a1, a2, a7	b11	c12	d7
PHYS102	Physics II	a1, a2, a7	b11	c12	d7

EE101	Electronics	a2	b11	c12	d1, d4 ,d7
EE102	Digital Circuits	a2	b11	c12	d1 , d7
EE201	Digital Signal Processing	a1, a2, a7	b11	c12	d1, d7

مقررات الحوسبة الأساسية

Code	Course name	Intended Learning Outcomes (ILOs)			
		Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
CS141	Programming Fundamentals	a9,a23	b2	c2, c7	d1
CS211	Data Structures and Algorithms	a6, a10	b5, b9, b11	c7, c15	d2,d10
CS241	Object-Oriented Programming	a6, a9, a23	b2, b6	c2, c7	d1
CS322	Operating Systems	a6,a16	b12,b23	c15	d1, d4
CS341	Visual Programming	a6, a9, a23	b2, b4, b6	c2, c7	d1, d8,d9
CS361	Artificial Intelligence	a10, a24	b2, b6, b13, b21	c1, c7	d1, d9, d10
SE201	Introduction to Software Engineering	a6, a11, a16	b3, b6	c3, c5, c6	d1, d2, d11
IS201	Foundations of Information Systems	a21	b17	c13	d6, d7
IS211	File Organization	a1,a3	b4, b5	c1, c2, c7	d4, d6, d7
IS212	Databases	a8	b18	c12	d1
IS231	Systems Analysis and Design	a6, a10	b5, b9, b11	c7, c15	d2,d10
IT101	IT Fundamentals	a2, a22	b2	c2	d4
IT251	Data Communications	a4	b2	c2	d4
IT351	Computer Networks	a4,a5	b19	C12	d1, d4
CE221	Computer Architecture	a2	b2	c2	d4
MM301	Introduction to Multimedia Technology	a16	b14	c2, c3	d2, d3

مقررات تخصص هندسة البرمجيات

Code	Course Name	Intended Learning Outcomes (ILOs)			
		Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
SE331	Software Design Architecture	a6, a11, a16	b3, b6	c3, c5, c6	d1, d2, d11
SE332	Software Construction	a2,a6, a11, a16	b3, b6,b20	c3, c5, c6,c15	d1, d2, d10, d11
SE321	Software	a6, a7, a11,	b3, b4, b6,	c3, c5, c6, c7,	d1
SE422	Software Quality Assurance and	a16, a17, a18	b7, b8, b16	c4, c5, c11, c14	d7
IT472	Web Applications Engineering	a4,a5	b20	c12	d1, d4
CS342	Automata and Language Theory	a1, a2, a11	b18,b20, b21, b22	c4, c6, c15	d2, d7 ,d10
SE301	Human Computer Interaction	a9, a22, a26	b5, b9, b11, b13, b18, b19	c9, c15, c16	d1, d3, d5, d11
SE333	Agile Methods	a16, a27	b9, b23	c5, c9, c13, c15, c16	d1, d3, d5, d11
SE311	Open Source Software	a2, a6, a14	b4,b6,b7	c3,c4,c5,c13	d3,d4,d5
SE322	Real-Time Software and Systems	a17, a26	b8, b9, b13	c3, c5, c13	d4,d5, d9
SE412	Estimating Software Development & Maintenance Projects	a18	b6, b7, b16, b18	c9, c13	d3, d4, d9
SE431	Mobile Software Design	a1, a6, a11, a16,a25	b3, b6, b9, b21, b22	c3, c5, c6,c15	d2, d3,d10
CE422	Embedded Systems	a1, a25	b21, b22	c15	d2, d3
SE441	Global Software Development	a6, a14	b6,b7	c3,c4,c5,c13	d3,d4,d5
SE421	Mining Software Engineering Data	a14,a15	b7,b8,b18	c4	d2,d6
CS471	Introduction to Computer Security	a14, a19, a20	b14	C12	d4,d7
SE434	Embedded Systems Software Design	a1, a6, a11, a16,a26	b3, b6, b21, b22	c3,c5, c6,c15	d2, d3
IT431	Wireless and Mobile Computing	a1, a6, a11, a16,a25	b3, b6, b9, b20, b21, b22	c3, c5, c6,c15	d2, d3, d10
IT451	Network Analysis and Design	a4,a5	b14	c12	d1, d4
IS441	Quality Assurance of Information	a16, a17, a18	b7, b8, b16	c4, C5, c11, c14	d7

مقررات المشروعات والتدريب

Code	Course Name	Intended Learning Outcomes (ILOs)			
		Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
IS221	Project Management	a11, a12, a14, a16, a18, a20	b7, b8, b9, b11, b12	c3, c6, c9, c13	d1, d5, d6
CS381	Software Development and Professional Practice	a7, a11, a12	b4, b11	c2, c3, c9, c10, c13	d1, d2, d3, d6
SE341	Field Training	a1, a2, a25	b1, b2, b14, b21, b22	c1, c2, c3, c4, c15	d2, d4
SE432	Capstone Project I	a7, a11, a12	b4, b11	c2, c3, c9, c10, c13	d1, d2, d3, d6
SE433	Capstone Project I	a7, a11, a12	b4, b11	c2, c3, c9, c10, c13	d1, d2, d3, d6

7. Matching the academic reference standards to the program's ILOs

1. Knowledge and Understanding

Academic Reference Standards	The programmer's ILOs
A1. Concepts and theories of mathematics and science related to the field of software engineering	a1, a2, a3, a22
A2. Basics of computer networking and networks	a4, a5
A3. Principles of software design including components, pattern, objects and entities design	a6, a7, a8
A4. Methodologies for solving problems especially problems related to software design, analysis and developing	a9, a10, a11, a12, a24
A5. Professional ethics and socio-economic impact of software production and engineering	a13, a14, a15
A6. Current technologies and tools used for software production, development and engineering	a16
A7. Software quality assurance, verifications and validation.	a17, a18
A8. Software security, safety and environmental issues	a19, a20
A9. Software project management and its links and relation to the business systems	a21
A10. Advanced topics in software engineering	a25, a26, a27
A11. Professional ethics in information technology environment and human rights	a13
A12. Impact of software engineering in the global and societal context.	a14

2. Intellectual Skills

National Academic Reference Standards	The programmer's ILOs
B1. Model problems using mathematical models, programming methods and software engineering techniques.	b1, b2, b3
B2. Create and/or design piece of software(module, component, design pattern and class) based on the principles of software design and engineering	b4, b5
B3. Have analytical thinking that enables him/her to select appropriate solutions for software design and developing problems	b6
B4. Take into consideration the adoption, economical and risks aspects involved in the process of software engineering	b7
B5. Assess and evaluate the performance of software systems	b8
B6. Solve the problems encountered in the process of software design and production taking into consideration the limitations and the practical criteria and constraints of the computation capabilities	b9, b10, b11, b12
B7. Analyze the results of computational models besides the limitations of the computing capabilities.	b10, b13
B8. Maintain a systematic approach in dealing with advanced technologies in the field of software engineering	b14
B9. Judge costs, benefits, quality, reliability and environmental impact of software systems production and adoption.	b15, b16, b17
B10. Analyze systems, processes and components critically	b18, b19, b20,b21,b22
B11. Select appropriate tools and technologies to varieties of software engineering problems	b11,b23

3. Professional and Practical Skills

National Academic Reference Standards	The programmer's ILOs
C1. Integrate knowledge of mathematics, science, IT, business context and software engineering in order to solve problems in the area of software production and adoption.	c1, c2, c3
C2. Collect, analyze and interpret data using software and hardware tools beside the ability to design test cases.	c4, c5, c6, c16
C3. Develop and improve software design, products and service.	c7,c15
C4. Solve software problems using numerical modeling and programming techniques	c1, c2,c8
C5. Implement comprehensive computing knowledge and intellectual skills in projects	c9
C6. Commercialize knowledge and skills to the software market and industry	c10
C7. Apply principles of safety, reliability in developing software	c11
C8. Prepare and present technical materials	c12
C9. Demonstrate software project management skills	c13 ,c15
C10. Appreciate the neatness and aesthetics in software design	c14.

4. General and transferable skills

National Academic Reference Standards	The programmer's ILOs
D1. Work efficiently in a team	d1
D2. Work in stressful environment and within constraints	d2
D3. Communicate effectively	d3
D4. Demonstrate efficient IT capabilities	d4
D5. Lead and motivate individuals	d5
D6. Manage tasks and resources	d6
D7. self-learning and information gathering	d7, d11
D8. Acquire entrepreneurial skills	d8
D9. Demonstrate critical thinking and problem solving skills	d9, d10

8. Program Academic Standards

- 1- National Academic Reference Standards (NARS) for Computing and Information, October 2010.
- 2- Standards of Higher Supreme Education Council for the Egyptian Universities.
- 3- Standards of ACM/IEEE CS curricula 2013 (Ironman report) .

CCIT, BSc in Software Engineering Program Specification, 2013



SE Program Matrices



SE Undergraduate Program Matrices

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

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

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

2. Program Matrix IV (Courses – Intellectual Skills)

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

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

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

4. Program Matrix VI (Courses – Transferable Skills)

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

Academic Standards (Knowledge and Understanding Skills)(October2010)Software Engineering

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
a1. Identify the essential facts, concepts, principles, and theories relating to basics of Mathematics.	K1	A1, A3	1. Essential facts, concepts, principles and theories relating to computing and information and computer applications as appropriate to the program of study.	A1. Understand the essential mathematics relevant to computer science A3. Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics
a2. Identify the basics, essential facts, concepts, principles, and theories relating to electronics for computer design.		A7, A9, A10, A11, A13		A7 Understand the fundamental topics in Computer Science, including hardware and software architectures, software engineering principles and methodologies, operating systems, compilers, parallel and distributed computing, systems and software tools. A9. Demonstrate knowledge and competence in fundamental areas of computer science such as: algorithms, design and analysis, computational theory, computer architecture and software based systems. A10. Apply mathematical foundations, algorithmic principles, and computer

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
				<p>science theory in the modeling and design, implementation, evaluation and evolution of computer-based systems.</p> <p>A11. Apply knowledge of mathematics and science to real world problems; as well as to analyze and interpret data.</p> <p>A13. Understand and apply a wide range of principles and tools of software engineering, such as design methodologies, choice of algorithm, language, software libraries and user interface technique</p>
a3. List the basics of Management.	K8		8.Management and economics principles relevant to computing and information disciplines	
a4. Know, understand, and describe the basics of Networking		A16		A16. Demonstrate an understanding of algorithms and data structures, computer organization and architecture, programming language concepts, compilers, networks, artificial intelligence, graphics, human computer interfaces, and databases, and identify and define the computing requirements for its

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
				solution
a5. Recognize different Networks Designs.		A16		A16. Demonstrate an understanding of algorithms and data structures, computer organization and architecture, programming language concepts, compilers, networks, artificial intelligence, graphics, human computer interfaces, and databases, and identify and define the computing requirements for its solution
a6. Identify and understand the principles basics of software design.	K2, K3	A13	2. Modeling and design of computer-based systems bearing in mind the trade-offs 3.Tools, practices and methodologies used in the specification, design, implementation and evaluation of computer software systems	A13. Understand and apply a wide range of principles and tools of software engineering, such as design methodologies, choice of algorithm, language, software libraries and user interface technique .
a7. Understand the design of components, objects and patterns.	K3	A16	3.Tools, practices and methodologies used in the specification, design, implementation and evaluation of computer software systems	A16. Demonstrate an understanding of algorithms and data structures, computer organization and architecture, programming language concepts, compilers, networks, artificial intelligence, graphics, human computer interfaces, and databases, and identify and define the

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
				computing requirements for its solution
a8. Identify and understand the basics of database design.	K1	A9	1.Essential facts, concepts, principles and theories relating to computing and information and computer applications as appropriate to the program of study	A9. Demonstrate knowledge and competence in fundamental areas of computer science such as: algorithms, design and analysis, computational theory, computer architecture and software based systems

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
a9. Know and understand the principles of programming	K1, K3	A1	<p>1. Essential facts, concepts, principles and theories relating to computing and information and computer applications as appropriate to the program of study.</p> <p>3. Tools, practices and methodologies used in the specification, design, implementation and evaluation of computer software systems</p>	<p>A2. Use high-level programming languages</p> <p>A5. Know and understand the principles and techniques of a number of application areas informed by the research directions of the subject, such as artificial intelligence, natural language processing, data mining, databases and computer graphics.</p> <p>A10. Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design, implementation, evaluation and evolution of computer-based systems</p> <p>A12. Demonstrate the analytic skills necessary to effectively evaluate the relative merits of software and computer systems, and algorithmic approaches</p>
a10. Classify problem solving techniques.	K4	A12	<p>4. Criteria and specifications appropriate to specific problems, and plan strategies for their solution</p>	<p>A12. Demonstrate the analytic skills necessary to effectively evaluate the relative merits of software and computer systems, and algorithmic</p>

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
				approaches
a11.Describe software systems analysis.	K2	A15	2. Modeling and design of computer-based systems bearing in mind the trade-offs	A15. Have a solid understanding of the used concepts in computer science to be able to pursue further learning, whether as graduate students or on their own.
a12.Identify software systems design.	K2	A10, A15	2. Modeling and design of computer-based systems bearing in mind the trade-offs	<p>A10. Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design, implementation, evaluation and evolution of computer-based systems</p> <p>A15. Have a solid understanding of the used concepts in computer science to be able to pursue further learning, whether as graduate students or on their own.</p>
a13.Describe legal, moral, and ethical aspects of software systems.	K9		9.Professional, moral and ethical issues involved in the exploitation of computer technology and be guided by the appropriate professional, ethical and legal practices relevant to the computing	

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
			and information industry	
a14.Explain Social impacts of software engineering	K9		9.Professional, moral and ethical issues involved in the exploitation of computer technology and be guided by the appropriate professional, ethical and legal practices relevant to the computing and information industry	
a15.Recognize, explain, predict, and manage individual and team behavior in organizations	K8		8.Management and economics principles relevant to computing and information disciplines	
a16.Recognize tools for software engineering production and engineering	K3	A13	3. Tools, practices and methodologies used in the specification, design, implementation and evaluation of computer software systems	A13. Understand and apply a wide range of principles and tools of software engineering, such as design methodologies, choice of algorithm, language, software libraries and user interface technique.
a17.Describe Software quality assurance.	K5	A17	5. The extent to which a computer-based system meets the criteria defined for its current use and future development	A17. Design, implement, and evaluate a computer-based systems, process, component or program.
a18.Recognize Software verifications and validation.	K7	A17	7. Principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results	A17. Design, implement, and evaluate a computer-based systems, process, component or program.

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
a19. Understand the Security issues		A16		A16. Demonstrate an understanding of algorithms and data structures, computer organization and architecture, programming language concepts, compilers, networks, artificial intelligence, graphics, human computer interfaces, and databases, and identify and define the computing requirements for its solution.
a20. Specify safety and environmental issues in software engineering		A17, A18		A17. Design, implement, and evaluate a computer-based systems, process, component or program. A18. Use knowledge and understanding in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoff involved in design choices.
a21. Understand software project management fundamentals	K8		8. Management and economics principles relevant to computing and information disciplines	
a22. Clarify the fundamental concepts, principles, theories and results of mathematics relevant to computer science	K1	A9	1. Essential facts, concepts, principles and theories relating to computing and information and computer applications as appropriate to the program of study	A9. Demonstrate knowledge and competence in fundamental areas of computer science such as: algorithms, design and analysis, computational theory, computer architecture and

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
				software based systems.
a23. Identify theories, computability and computer programming languages		A11, A15		<p>A11. Apply knowledge of mathematics and science to real world problems; as well as to analyze and interpret data.</p> <p>A15. Have a solid understanding of the used concepts in computer science to be able to pursue further learning, whether as graduate students or on their own.</p>
a24. Describe the principles and techniques of different application		A9, A11, A13		<p>A9. Demonstrate knowledge and competence in fundamental areas of computer science such as: algorithms, design and analysis, computational theory, computer architecture and software based systems.</p> <p>A11. Apply knowledge of mathematics and science to real world problems; as well as to analyze and interpret data</p> <p>A13. Understand and apply a wide range of principles and tools of software engineering, such as design methodologies, choice of algorithm, language, software libraries and user interface technique</p>

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
a25. Know and understand the principles and techniques of several application areas informed by the research directions of software engineering	K5	A9, A11, A13,	5. The extent to which a computer-based system meets the criteria defined for its current use and future development	<p>A9. Demonstrate knowledge and competence in fundamental areas of computer science such as: algorithms, design and analysis, computational theory, computer architecture and software based systems.</p> <p>A11. Apply knowledge of mathematics and science to real world problems; as well as to analyze and interpret data</p> <p>A13. Understand and apply a wide range of principles and tools of software engineering, such as design methodologies, choice of algorithm, language, software libraries and user interface technique</p>
a26. Understand the complexity analysis of software and real time system		A12		A12. Demonstrate the analytic skills necessary to effectively evaluate the relative merits of software and computer systems, and algorithmic approaches
a27. Understand concept of agile software engineering and its advantages in software development and recognize various agile methods such as Extreme Programming (XP) and Scrum		A17, A18		<p>A17. Design, implement, and evaluate a computer-based systems, process, component or program.</p> <p>A18. Use knowledge and understanding in the modeling and design of</p>

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs - Special
				computer-based systems in a way that demonstrates comprehension of the tradeoff involved in design choices.

Academic Standards (Intellectual Skills)

Software Engineering ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs – Special
b1. Solve problems mathematically.	1	1	1. Analyze computing problems and provide solutions related to the design and construction of computing systems.	1. Define problems in precise scientific manner.
b2. Model problems using programming and information technology	1,3-5	1,3,5	1. Analyze computing problems and provide solutions related to the design and construction of computing systems. 3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution. 4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints. 5. Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems.	1. Define problems in precise scientific manner. 3. Observe results and attitudes. 5. Perform comparisons between algorithms, methods, and techniques.
b3. Model problems using software engineering techniques	3,11	1,3,8,10	3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution. 11. Analyze computing problems and	1. Define problems in precise scientific manner. 3. Observe results and attitudes.

			provide solutions related to the design and construction of computing systems.	8. Identify relationships and patterns. 10. Identify errors.
b4. Create and/or design software components, objects, and classes	1-8	4,9,10	<p>1. Analyze computing problems and provide solutions related to the design and construction of computing systems.</p> <p>2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.</p> <p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.</p> <p>4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints.</p> <p>5. Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems.</p> <p>6. Evaluate the results of tests to investigate the functionality of computer systems.</p> <p>7. Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact</p>	<p>4. Formulate clear questions and models for any real-life problems.</p> <p>9. Identify main ideas.</p> <p>10. Identify errors.</p>

			8. Familiar with the professional, legal, moral and ethical issues relevant to the computing industry.	
b5. Collect the essential facts, concepts, principles, and theories relating to computer science and their relationship to one another	2-4,6,9	4,8,9	<p>2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.</p> <p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.</p> <p>4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints</p> <p>6. Evaluate the results of tests to investigate the functionality of computer Systems</p> <p>9. Evaluate research papers in a range of knowledge areas</p>	<p>4. Formulate clear questions and models for any real-life problems.</p> <p>8. Identify relationships and patterns.</p> <p>9. Identify main ideas.</p>
b6. Select appropriate solutions for problems in software design and development	1,3,4,7,8	1,4-6	<p>1. Analyze computing problems and provide solutions related to the design and construction of computing systems</p> <p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.</p>	<p>1. Define problems in precise scientific manner.</p> <p>4. Formulate clear questions and models for any real-life problems.</p> <p>5. Perform comparisons between algorithms,</p>

			<p>4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints</p> <p>7. quality, reliability, and environmental impact</p> <p>8. Familiar with the professional, legal, moral and ethical issues relevant to the computing industry</p>	<p>methods, and techniques.</p> <p>6. Perform classifications of (data, results, methods, techniques, algorithms, etc.).</p> <p>9. Identify main ideas.</p> <p>10. Identify errors</p>
b7. Analyze risks and economical aspects in the management of software projects	4,7-9	4,7-10	<p>4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints</p> <p>7. Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact</p> <p>8. Familiar with the professional, legal, moral and ethical issues relevant to the computing industry.</p> <p>9. Evaluate research papers in a range of knowledge areas</p>	<p>4. Formulate clear questions and models for any real-life problems</p> <p>7. Identify attributes and components</p> <p>8. Identify relationships and patterns</p> <p>9. Identify main ideas.</p> <p>10. Identify errors</p>
b8. Assess and evaluate the performance of software systems	3,6	3,4	<p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution</p>	<p>3. Observe results and attitudes.</p> <p>4. Formulate clear questions and models for any real-life</p>

			6. Evaluate the results of tests to investigate the functionality of computer systems.	problems
b9. Solve the problems encountered in software design and production	1,3	1,5,7	1. Analyze computing problems and provide solutions related to the design and construction of computing systems 3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution	1. Define problems in precise scientific manner 5. Perform comparisons between algorithms, methods, and techniques 7. Identify attributes and components
b10. Apply computer science in solving problems with numerical tools constraints using recent development in computer technology	1-3,5,6,9	1,2,4,5,8	1. Analyze computing problems and provide solutions related to the design and construction of computing systems. 2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline. 3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution 5. Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems. 6. Evaluate the results of tests to investigate the functionality of computer 9. Evaluate	1. Define problems in precise scientific manner 2. Set goals towards solving traditional and nontraditional problems 4. Formulate clear questions and models for any real-life problems 5. Perform comparisons between algorithms, methods, and techniques 8. Identify relationships and patterns

			research papers in a range of knowledge areas	
b11. Select appropriate tools and technologies used in software engineering	2,3,6	4,9,10	<p>2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline</p> <p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution</p> <p>6. Evaluate the results of tests to investigate the functionality of computer systems</p>	<p>4. Formulate clear questions and models for any real-life problems</p> <p>9. Identify main ideas.</p> <p>10. Identify errors.</p>
b12. Model the practical criteria and constraints in the adoption of the software systems in business environment	3,5,6-8	2,4,7	<p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution</p> <p>5. Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems</p> <p>6. Evaluate the results of tests to investigate the functionality of computer systems</p> <p>7. Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact</p> <p>8. Familiar with the professional, legal, moral and ethical issues relevant to the</p>	<p>2. Set goals towards solving traditional and nontraditional problems</p> <p>4. Formulate clear questions and models for any real-life problems</p> <p>7. Identify attributes and components</p>

			computing industry	
b13. Analyze the results of computational models	2-5,7,8	2,3	<p>2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.</p> <p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.</p> <p>4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints.</p> <p>5. Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems</p>	<p>2. Set goals towards solving traditional and nontraditional problems</p> <p>3. Observe results and attitudes</p>
b14. Organize the crucial role of intellectual properties (IP) in organizations of different industrial sectors for the purposes of product and technology development	3,6,9	4,8-10	<p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.</p> <p>6. Evaluate the results of tests to investigate the functionality of computer systems.</p> <p>9. Evaluate research papers in a range of knowledge areas</p>	<p>4. Formulate clear questions and models for any real-life problems</p> <p>8. Identify relationships and patterns</p> <p>9. Identify main ideas.</p> <p>10. Identify errors.</p>
b15. Revise activities and categorize IP infringements and the remedies available to the IP owner and describe the precautions	1,2,5,6,8,9	2, 3	<p>1. Analyze computing problems and provide solutions related to the design and</p>	<p>2. Perform comparisons between (algorithms,</p>

steps to be taken to prevent infringement of proprietary rights in products and technology development			<p>construction of computing systems.</p> <p>2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline</p> <p>5. Make ideas, proposals and designs using rational and reasoned arguments for presentation of computing systems.</p> <p>6. Evaluate the results of tests to investigate the functionality of computer Systems</p> <p>8. Familiar with the professional, legal, moral and ethical issues relevant to the computing industry.</p> <p>9. Evaluate research papers in a range of knowledge areas</p>	<p>methods, techniques...etc).</p> <p>3. Perform classifications of (data, results, methods, techniques, algorithms.. etc.).</p>
b16. Estimate the quality and reliability of software systems	2-4,6,8,9	4	<p>2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.</p> <p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.</p> <p>4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints</p>	<p>4. Identify attributes, components, relationships, patterns, main ideas, and errors</p>

			6. Evaluate the results of tests to investigate the functionality of computer Systems 8. Familiar with the professional, legal, moral and ethical issues relevant to the computing industry. 9. Evaluate research papers in a range of knowledge areas	
b17. Judge the environmental impact of the adoption of the software	6,8,9	4	6. Evaluate the results of tests to investigate the functionality of computer systems. 8. Familiar with the professional, legal, moral and ethical issues relevant to the computing industry. 9. Evaluate research papers in a range of knowledge areas	4. Identify attributes, components, relationships, patterns, main ideas, and errors
b18. Apply inter-personal communication skills to diagnose and analyze organizational and behavioral problems and recommend appropriate courses of action	1,3,4,6,9		1. Analyze computing problems and provide solutions related to the design and construction of computing systems 3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution. 4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints	1. Define traditional and nontraditional problems, set goals towards solving them, and. observe results 3. Perform classifications of (data, results, methods, techniques, algorithms.. etc.). 4. Identify attributes, components, relationships, patterns, main ideas, and

				<p>errors</p> <p>5. Summarize the proposed solutions and their results</p> <p>7. Establish criteria, and verify solutions</p>
b19. Perform comparisons between algorithm, methods, techniques... etc	2,3,6,9	2.3	<p>2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.</p> <p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.</p> <p>6. Evaluate the results of tests to investigate the functionality of computer Systems</p> <p>9. Evaluate research papers in a range of knowledge areas</p>	<p>2. Perform comparisons between (algorithms, methods, techniques...etc).</p> <p>3. Perform classifications of (data, results, methods, techniques, algorithms.. etc.).</p>
b20. Perform classification of data, results, methods, techniques, algorithm ... etc	2,3,6,9	1-3	<p>2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.</p> <p>3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution.</p> <p>6. Evaluate the results of tests to investigate</p>	<p>1. Define traditional and nontraditional problems, set goals towards solving them, and. observe results</p> <p>2. Perform comparisons between (algorithms, methods, techniques...etc).</p> <p>3. Perform classifications of (data, results, methods,</p>

			the functionality of computer Systems 9. Evaluate research papers in a range of knowledge areas	techniques, algorithms.. etc.).
b21. Illustrate attributes, components, relationships, patterns, main ideas, and errors of the system	2,3,5,7,9	1-3,5,6	2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline. 3. Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution. 7. Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact 9. Evaluate research papers in a range of knowledge areas	1. Define traditional and nontraditional problems, set goals towards solving them, and. observe results. 2. Perform comparisons between (algorithms, methods, techniques...etc). 3. Perform classifications of (data, results, methods, techniques, algorithms.. etc.) 5. Summarize the proposed solutions and their results 6. Restrict solution methodologies upon their results
b22. Investigate advanced tools in software engineering	2-6,9	6-8,10	2. Realize the concepts, principles, theories and practices behind computing and information as an academic discipline. 4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality	6. Restrict solution methodologies upon their results 7. Establish criteria, and verify solutions. 8. Identify a range of

			constraints. 6. Evaluate the results of tests to investigate the functionality of computer systems	solutions and critically evaluate and justify proposed 10.design solutions
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Academic Standards (Professional and Practical Skills)

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs - General	NARS ILOs – Special
c1. Use mathematics for solving problems and modeling solution.	2,6	3,12	2. Implement comprehensive computing knowledge and skills in projects and in deployment of computers to solve position practical problems. 6. Design, implement, maintain, and manage software systems..	3. Perform classifications of (data, results, methods, techniques, algorithms.. etc.). 12. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process
c2. Use programming and information technology concepts for solving problems.	2,6	1	2. Implement comprehensive computing knowledge and skills in projects and in deployment of computers to solve position practical problems. 6. Design, implement, maintain, and manage software systems	1. Use appropriate programming languages, web-based systems and tools, design methodologies, and knowledge and database systems
c3. Solve problems in software productions and adoption.	2,6	1,8,12	2. Implement comprehensive computing knowledge and skills in projects and in deployment of computers to solve position practical problems. 6. Design, implement, maintain, and manage software systems	1. Use appropriate programming languages, web-based systems and tools, design methodologies, and knowledge and database systems 8. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem. 12. Deploy effectively the tools used for the construction

				and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems
c4. Analyze data.		5		5. Perform independent information acquisition and management, using the scientific literature and Web sources
c5. Design test cases.	8	5,12	8.Handle a mass of diverse data, assess risk and draw conclusions	5. Perform independent information acquisition and management, using the scientific literature and Web sources 12.Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems
c6. Use software tools in order to collect and interpret data.	5, 6, 8	13	5.Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material 6.Design, implement, maintain, and manage software systems 8. Handle a mass of diverse data, assess risk and draw conclusions.	13. Prepare technical reports, and a dissertation, to a professional standard.

c7. Design and implement software solutions.	6	6, 12, 13	6. Design, implement, maintain, and manage software systems.	<p>6. Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature computer literacy</p> <p>12. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.</p> <p>13. Prepare technical reports, and a dissertation, to a professional standard.</p>
c8. Use scientific literature and web resources effectively to perform appropriate technical presentations on ethical basis, and apply computer programs in numerical problems.	5,8	6, 13	<p>5. Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material</p> <p>8. Handle a mass of diverse data, assess risk and draw conclusions.</p>	<p>6. Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature computer literacy</p> <p>13. Prepare technical reports, and a dissertation, to a professional standard..</p>
c9. Apply software engineering principle in developing software projects.	2,6	6, 12, 13	<p>2. Implement comprehensive computing knowledge and skills in projects</p> <p>6. Design, implement, maintain, and manage software systems.</p>	<p>6. Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature computer literacy</p> <p>12. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems</p>

				13. . Prepare technical reports, and a dissertation, to a professional standard.
c10. Demonstrate effectively the tools used for the construction and documentation of software, with emphasis on understanding the whole process involved in using computers to solve practical problems.	2	2,5,12	2.Implement comprehensive computing knowledge and skills in projects	2. Communicate effectively by oral, written and visual means 5. Perform independent information acquisition and management, using the scientific literature and Web sources 12. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems
c11. Apply principles of safety and reliability in developing software.	4	2,11	4. Apply computing information retrieval skills in computing community environment and industry.	2. Communicate effectively by oral, written and visual means 11. Identify any risks or safety aspects that may be involved in the operation of computing equipment within a given context
c12. Prepare technical materials.	2,8	2,7	2.Implement comprehensive computing knowledge and skills in projects and in deployment of computers to solve position practical problems 8.Handle a mass of diverse data, assess risk and draw conclusions	2.Communicate effectively by oral, written and visual means 7. Specify, design, and implement computer-based systems 12. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical

				<p>problems</p> <p>13. Prepare technical reports, and a dissertation, to a professional standard</p>
c13. Design the management software projects.	2,5,6	2,5,7,9,12	<p>2. Implement comprehensive computing knowledge and skills in projects and in deployment of computers to solve position practical problems</p> <p>5. Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material</p> <p>6. Design, implement, maintain, and manage software systems.</p>	<p>2. Communicate effectively by oral, written and visual means</p> <p>5. Perform independent information acquisition and management, using the scientific literature and Web sources</p> <p>7. Specify, design, and implement computer-based systems</p> <p>9. Apply the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video.</p> <p>12. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems</p>
c14. Consider the neatness and aesthetics in software design.	5	2, 5, 7, 9, 11, 12	<p>5. Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material</p> <p>6. Design, implement, maintain, and</p>	<p>2. Communicate effectively by oral, written and visual means</p> <p>5. Perform independent information acquisition and management, using the scientific literature and Web sources.</p> <p>7. Specify, design, and implement computer-based</p>

			manage software systems	<p>systems</p> <p>9. Apply the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video</p> <p>11. Identify any risks or safety aspects that may be involved in the operation of computing equipment within a given context.</p> <p>12. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems</p>
c15. Specify, design, and implement computer-based system	2, 5, 6	2, 5, 7, 9, 12	<p>2. Implement comprehensive computing knowledge and skills in projects and in deployment of computers to solve position practical problems</p> <p>5. Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material</p> <p>6. Design, implement, maintain, and manage software systems</p>	<p>2. Communicate effectively by oral, written and visual means</p> <p>5. Perform independent information acquisition and management, using the scientific literature and Web sources.</p> <p>7. Specify, design, and implement computer-based systems</p> <p>9. Apply the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video</p> <p>12. Deploy effectively the tools used for the construction</p>

				and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.
c16. Write user stories for project requirements and write test cases for developing features.	5,6	2,6,9,12	<p>5. Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material</p> <p>6. Design, implement, maintain, and manage software systems</p>	<p>2. Communicate effectively by oral, written and visual means</p> <p>6. Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature computer literacy</p> <p>9. Apply the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video</p> <p>12. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems</p>

Academic Standards (Transferable Skills)

Software Engineering Program ILOs	Corresponding in NARS		NARS ILOs – General	NARS ILOs - Special
d1. Show Work efficiently in a team.	2,6		<p>2. Demonstrate skills in group working, team management, time management and organizational skills</p> <p>6. Reveal communication skills, public speaking and presentation skills, and delegation, writing skills, oral delivery, and effectively using various media for a variety of audiences.</p>	–
d2. Work effectively as an individual and as a member of a team.	1-3, 7		<p>1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning</p> <p>2. Demonstrate skills in group working, team management, time management and organizational skills.</p> <p>3. Show the use of information-retrieval, maintenance and documentation of computer applications.</p> <p>7. Show the use of general computing facilities.</p>	
d3. Communicate effectively.	2,6		<p>2. Demonstrate skills in group working, team management, time</p> <p>6. Reveal communication skills, public speaking and presentation skills, and delegation, writing skills, oral delivery, and effectively using various media for a variety of audiences.</p>	
d4. Use IT tools efficiently.	4,8		<p>4. 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</p>	

			community. 8. Demonstrate an appreciation of the need to continue professional development in recognition of the requirement for life-long learning.	
d5. Lead teamwork efficiently.			2. Demonstrate skills in group working, team management, time management and organizational skills. 6. Reveal communication skills, public speaking and presentation skills, and delegation, writing skills, oral delivery, and effectively using various media for a variety of audiences.	
d6. Take apart of manage tasks and resources.	2,6		2. Demonstrate skills in group working, team management, time management and organizational skills. 6. Reveal communication skills, public speaking and presentation skills, and delegation, writing skills, oral delivery, and effectively using various media for a variety of audiences.	
d7. Search for information independently.	1,3,8		1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning. 3. Show the use of information-retrieval. 8. Demonstrate an appreciation of the need to continue professional development in recognition of the requirement for life-long learning.	
d8. Lead and motivate individuals.	1,4		1. Demonstrate the ability to make use of a range of learning resources and to manage one's own	

			4. 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.	
d9. Demonstrate critical thinking.				
d10. Show analytical thinking and the ability to solve problems.	1,3,4		<p>1. Demonstrate the ability to make use of a range of learning resources and to manage one's own</p> <p>3. Show the use of information-retrieval.</p> <p>4. Use an appropriate mix of tools and aids in preparing and presenting reports for a range of audiences, including management, technical, users, industry or the academic community.</p>	
d11. Understand a new topic (self-learning).	1		1. Demonstrate the ability to make use of a range of learning resources and to manage one's own	

Program Matrix III (Courses - Knowledge and Understanding Skills)

Code	Course	a 1	a 2	a 3	a 4	a 5	a 6	a 7	a 8	a 9	a 10	a 11	a 12	a 13	a 14	a 15	a 16	a 17	a 18	a 19	a 20	a 21	a 22	a 23	a 24	a 25	a 26	a 27
HUM111	English I								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM112	English II							<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM121	Social Context of Computing	√	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM122	Intellectual Property						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	√	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM131	Organizational Behavior							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM132	Interpersonal Communication						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM133	Computing Economics						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM141	Computer Law								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM142	Privacy and Civil Liberties	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM151	Hand Drawing	√	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM152	History of Computing						√	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM153	Islamic Culture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM154	Scientific Thinking	√	√				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM231	Business Administration			√		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM232	Technical Writing							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM241	Computers and Ethics			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATH101	Mathematics I	√				<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATH102	Mathematics II	√							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATH201	Mathematics III	√				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATH202	Probability and Statistics			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATH301	Numerical Analysis	√			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS201	Discrete Structures	√		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS301	Operation Research	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS302	Simulation and Modeling	√				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PHYS101	Physics I	√	√				√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PHYS102	Physics II	√	√			<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EE101	Electronics	√						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EE102	Digital Circuits	√						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EE201	Digital Signal Processing	√	√				√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS141	Programming Fundamentals								√		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS211	Data Structures and Algorithms						√		<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS241	Object-Oriented Programming						√		√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS322	Operating Systems								√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>
CS341	Visual Programming						√		√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Program Matrix IV (Courses - Intellectual Skills)

Code	Course	b 1	b 2	b 3	b 4	b 5	b 6	b 7	b 8	b 9	b 10	b 11	b 12	b 13	b 14	b 15	b 16	b 17	b 18	b 19	b 20	b 21	b 22	b 23
HUM111	English I								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM112	English II							<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM121	Social Context of Computing	√	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM122	Intellectual Property						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM131	Organizational Behavior						<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM132	Interpersonal Communication						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM133	Computing Economics						<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM141	Computer Law								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM142	Privacy and Civil Liberties	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM151	Hand Drawing	√		√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM152	History of Computing	√	√				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM153	Islamic Culture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM154	Scientific Thinking	√	√				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM231	Business Administration					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM232	Technical Writing							√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM241	Computers and Ethics			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATH101	Mathematics I	√				<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATH102	Mathematics II	√							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATH201	Mathematics III	√				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATH202	Probability and Statistics	√		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATH301	Numerical Analysis	√			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS201	Discrete Structures	√		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS301	Operation Research	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS302	Simulation and Modeling		√				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PHYS101	Physics I								<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PHYS102	Physics II					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EE101	Electronics								<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EE102	Digital Circuits								<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EE201	Digital Signal Processing						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS141	Programming Fundamentals		√								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS211	Data Structures and Algorithms					√			√	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS241	Object-Oriented Programming		√						√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS322	Operating Systems		√			√				<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>
CS341	Visual Programming		√		√	√			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS361	Artificial Intelligence	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SE201	Introduction to Software Engineering			√		√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IS201	Foundations of Information								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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IS441	Quality Assurance of Information Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IS221	Project Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS381	Software Development and Professional Practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SE341	Field Training	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SE432	Capstone Project I	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SE433	Capstone Project I	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HUM111	English I	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Program MatrixV (Courses - Professional and Practical Skills)

Code	Course	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10	c11	c12	c13	c14	c15	c16
HUM111	English I												✓				
HUM112	English II												✓				
HUM121	Social Context of Computing	✓	✓	✓													
HUM122	Intellectual Property								✓						✓		
HUM131	Organizational Behavior												✓				
HUM132	Interpersonal Communication												✓				
HUM133	Computing Economics												✓				
HUM141	Computer Law												✓		✓		
HUM142	Privacy and Civil Liberties								✓								
HUM151	Hand Drawing		✓		✓												
HUM152	History of Computing																
HUM153	Islamic Culture									✓		✓					
HUM154	Scientific Thinking				✓												
HUM231	Business Administration													✓			
HUM232	Technical Writing																✓
HUM241	Computers and Ethics												✓		✓		
MATH101	Mathematics I	✓															
MATH102	Mathematics II	✓															
MATH201	Mathematics III	✓															
MATH202	Probability and Statistics	✓			✓												
MATH3	Numerical Analysis	✓															

01																				
CS201	Discrete Structures	✓																		
CS301	Operation Research	✓	✓																	
CS302	Simulation and Modeling	✓	✓	✓																
PHYS101	Physics I														✓					
PHYS102	Physics II														✓					
EE101	Electronics														✓					
EE102	Digital Circuits														✓					
EE201	Digital Signal Processing														✓					
CS141	Programming Fundamentals		✓					✓												
CS211	Data Structures and Algorithms							✓											✓	
CS241	Object-Oriented Programming		✓					✓												
CS322	Operating Systems																		✓	
CS341	Visual Programming		✓					✓												
CS361	Artificial Intelligence	✓						✓												
SE201	Introduction to Software Engineering			✓		✓	✓													
IS201	Foundations of Information Systems															✓				
IS211	File Organization	✓	✓					✓												
IS212	Databases														✓					
IS231	Systems Analysis and Design							✓											✓	
IT101	IT Fundamentals		✓																	
IT251	Data Communications		✓																	
IT351	Computer Networks														✓					
CE221	Computer Architecture		✓																	
MM301	Introduction to Multimedia Technology		✓	✓																
SE331	Software Design Architecture			✓		✓	✓													
SE332	Software Construction			✓		✓	✓												✓	
SE321	Software Requirements Analysis			✓		✓	✓	✓	✓											
SE422	Software Quality Assurance and Testing				✓	✓								✓				✓		
IT472	Web Applications Engineering														✓					
CS342	Automata and Language Theory				✓		✓												✓	
SE301	Human Computer Interaction									✓									✓	✓
SE333	Agile Methods					✓				✓						✓		✓	✓	✓
SE311	Open Source Software Development			✓	✓	✓										✓				
SE322	Real-Time Software and Systems			✓		✓										✓				

SE412	Estimating Software Development & Maintenance Projects									✓			✓		
SE431	Mobile Software Design			✓		✓	✓								✓
CE422	Embedded Systems														✓
SE441	Global Software Development			✓	✓	✓							✓		
SE421	Mining Software Engineering Data				✓										
CS471	Introduction to Computer Security											✓			
SE434	Embedded Systems Software Design			✓		✓	✓								✓
IT431	Wireless and Mobile Computing			✓		✓	✓								✓
IT451	Network Analysis and Design											✓			
IS441	Quality Assurance of Information Systems				✓	✓					✓			✓	
IS221	Project Management			✓			✓		✓				✓		
CS381	Software Development and Professional Practice		✓	✓					✓	✓			✓		
SE341	Field Training	✓	✓	✓	✓										✓
SE432	Capstone Project I		✓	✓					✓	✓			✓		
SE433	Capstone Project I		✓	✓					✓	✓			✓		

Program Matrix VI (Courses - Transferable Skills)

Code	Course	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11
HUM111	English I			✓				✓				
HUM112	English II			✓				✓				
HUM121	Social Context of Computing		✓									
HUM122	Intellectual Property				✓							
HUM131	Organizational Behavior	✓	✓	✓		✓						
HUM132	Interpersonal Communication	✓	✓	✓		✓						
HUM133	Computing Economics	✓					✓					
HUM141	Computer Law			✓								
HUM142	Privacy and Civil Liberties				✓			✓				
HUM151	Hand Drawing				✓			✓				
HUM152	History of Computing			✓			✓					
HUM153	Islamic Culture								✓			
HUM154	Scientific Thinking	✓								✓	✓	
HUM231	Business Administration		✓									
HUM232	Technical Writing		✓	✓								
HUM241	Computers and Ethics			✓								
MATH101	Mathematics I									✓		
MATH102	Mathematics II									✓		
MATH201	Mathematics III										✓	
MATH202	Probability and Statistics									✓		
MATH301	Numerical Analysis				✓							
CS201	Discrete Structures									✓		
CS301	Operation Research	✓										
CS302	Simulation and Modeling	✓										
PHYS101	Physics I							✓				
PHYS102	Physics II							✓				
EE101	Electronics	✓			✓			✓				
EE102	Digital Circuits	✓						✓				
EE201	Digital Signal Processing	✓						✓				
CS141	Programming Fundamentals	✓										
CS211	Data Structures and Algorithms		✓								✓	
CS241	Object-Oriented Programming	✓										
CS322	Operating Systems	✓			✓							
CS341	Visual Programming	✓							✓	✓		
CS361	Artificial Intelligence	✓								✓	✓	
SE201	Introduction to Software Engineering	✓	✓									✓
IS201	Foundations of Information Systems						✓	✓				
IS211	File Organization				✓		✓	✓				
IS212	Databases	✓										
IS231	Systems Analysis and Design		✓								✓	
IT101	IT Fundamentals				✓							

IT251	Data Communications				✓								
IT351	Computer Networks	✓			✓								
CE221	Computer Architecture				✓								
MM301	Introduction to Multimedia Technology		✓	✓									
SE331	Software Design Architecture	✓	✓										✓
SE332	Software Construction	✓	✓								✓	✓	
SE321	Software Requirements Analysis	✓											
SE422	Software Quality Assurance and Testing							✓					
IT472	Web Applications Engineering	✓			✓								
CS342	Automata and Language Theory		✓					✓			✓		
SE301	Human Computer Interaction	✓		✓	✓								✓
SE333	Agile Methods	✓		✓	✓								✓
SE311	Open Source Software Development			✓	✓	✓							
SE322	Real-Time Software and Systems				✓	✓					✓		
SE412	Estimating Software Development & Maintenance Projects			✓	✓						✓		
SE431	Mobile Software Design		✓	✓								✓	
CE422	Embedded Systems		✓	✓									
SE441	Global Software Development			✓	✓	✓							
SE421	Mining Software Engineering Data		✓					✓					
CS471	Introduction to Computer Security				✓			✓					
SE434	Embedded Systems Software Design		✓	✓									
IT431	Wireless and Mobile Computing		✓	✓								✓	
IT451	Network Analysis and Design	✓			✓								
IS441	Quality Assurance of Information Systems							✓					
IS221	Project Management	✓				✓	✓						
CS381	Software Development and Professional Practice	✓	✓	✓			✓						
SE341	Field Training		✓		✓								
SE432	Capstone Project I	✓	✓	✓			✓						
SE433	Capstone Project I	✓	✓	✓			✓						

Program Coordinator: Prof. Marghany Hassan

Signature:

Approved by the Dean: Prof. Taysir Hassan

Signature:

