John Jay College of Criminal Justice
City University of New York

Computer Information Systems (CIS) Major Assessment Plan
Department of Mathematics and Computer Science

Outline of Document

John Jay College of Criminal Justice
Computer Information Systems (CIS) Major Assessment Plan - Draft

I. Mission Statement

The Computer Information Systems (CIS) major offers the computing, quantitative and analytical expertise public and private organizations need to advance the practice of criminal justice and public administration. The program prepares students to be highly skilled computer professionals who assist in the investigation and prosecution of digital crimes and help develop and implement information systems required to improve law enforcement and public agency functions. The program provides the broad background in computing that is needed to thwart the abuse and misuse of computers, data networks, information systems and information infrastructures, in an environment of ever advancing digital technology. The courses prepare students for direct entry into the profession as well as entry into graduate and professional programs that rely on computing and quantitative methods, especially in areas related to criminal justice and public administration. Furthermore, the program prepares students for the life-long retraining that is an integral part of the computing profession.

II. Program Learning Objectives

The program learning objectives (As presented in *Appendix A: Curriculum Map*) for the CIS major are the following:

- L1: Use and critically evaluate the variety of theoretical approaches that are relevant to Computer Information Systems.

- L2: Use and critically evaluate the variety of practical/hands-on/research approaches that are relevant to Computer Information Systems.

- L3: Analyze the quality of the Computer Science and Information Systems program to enable graduates to be successful in the highly competitive high technology industries and graduate schools.

- L4: Communicate effectively through integrating theory, research and policy in written reports and presentations.

- L5: Demonstrate proper business ethics and professionalism in the proposal or evaluation of solution to Computer Information Systems applications.

III. Overview of Assessment Process

Assessment of these learning objectives will be performed in two-year cycles starting spring 2011 semester. A detailed alignment between program learning objectives and the courses' objectives are presented in *Appendix A: Curriculum Map*. The goal of the department is to assess at least two learning objectives in the first year and the final objectives over the following year. Annual assessment will provide data on specific learning objectives and allow the department to make minor curricular modifications where needed or desired to improve performance on that learning objective.

Spring 2011:

In the Spring 2011 semester, we create the initial assessment plan draft for the major. We further identify the courses that will be used for this assessment purpose and the corresponding Rubrics (*Appendices B – E*) are finalized. To get a comprehensive assessment of the major, we plan to assess courses from several tiers: *200-level*, *300-level* and *400-level*. More specifically, we plan to assess *MAT 272: Object-oriented Computing*, an introductory course from 200-level (refer to *Appendix B* for MAT 272 rubric); *MAT 323-324: Operations Research Models I and II* (refer to *Appendix C* for MAT 323-324 rubric) and *MAT 379: Computer Networking* from the 300-level (refer to *Appendix D* for MAT 379 rubric); and Capstone courses *MAT 400: Quantitative Problems in Criminal Justice* and *MAT 404: Internship in Management Information Systems* from 400-level (refer to *Appendix E* for Capstone rubric). With data collected in the MAT 324, Operations Research Models II from Spring 2011 semester, we also start the initial phase of the assessment process: assessing learning objective L2. The initial assessment is presented in *Appendix F*.

Fall 2011:

In Fall semester 2011, we will collect data from first Capstone course MAT 400: Quantitative Problems in Criminal Justice; MAT 379: Computer Networking; MAT 323: Operations Research models I; and MAT 272: Object-oriented Computing so that we can further assess learning objectives L1 and L2 in comprehensive manner from all stages of the courses. Additionally, we will also attempt to start with assessment of learning objective L4 by collecting data preferably from MAT 400 and MAT 272.

Spring 2012:

Data will be collected during the spring 2012 semester from second capstone course MAT 404: Internship in Management Information Systems that will give us comprehensive information on learning outcomes. The MAT 400, MAT 404 sequence is considered to be the capstone courses for the Criminal Justice Applied Specialization of the CIS major. The courses in the capstone sequence allow students to use knowledge and skills gleaned in lower level courses to solve problems that arise in criminal justice. Hence, collecting assessment data for these course sequences will provide invaluable information to the department concerning how well it is meeting its learning objectives. We will once again collect data in MAT 324 and MAT 379 in order to assess learning objectives L2-L4 and L1 – L5 respectively. The type of direct data we

will collect for the above assessments will include work from class projects, graded homework assignments or selected questions from class examinations.

Fall 2012:
In Fall 2012 semester, we will continue to assess the learning objectives using the capstone course MAT 400, MAT 324: Operations Research models II and MAT 272: Object-oriented Computing.

Starting fall 2012 semester, and every fall semester thereafter, we will also assess objective L3 by using alumni surveys collected by the John Jay Office of Institutional Research (OIR). The OIR conducts surveys of students 4 months, 2 years, and 5 years after graduation. Another method of indirect assessment we will use is a transcript analysis of graduating seniors to see how the student performed overall in the MAT 400 and MAT 404 sequence. Furthermore, a good number of CIS majors receive internships. After a student finishes an internship assignment, the department will mail the student's internship supervisor a questionnaire that will ask the supervisor to evaluate the student's performance in each of the department's learning objectives. This feedback will be extremely useful in assessing the department's learning outcomes.

During the fall 2012 semester the department will analyze collected assessment data and write a summary report. The department will then make curricular changes and adjustments based on this analysis. In future years we will also compare transition results for each outcome for students across the courses from 200-level to 300-level and onto 400-level thereafter. This way we can judge if we are achieving our goals by measuring improvement in student performances.

Assessment Process Schedule (tentative)

Semester	Items	Learning Objectives	Courses
Spring 2011	• Assessment planning draft • Identification of courses for assessment purpose • Rubrics • Identification of direct assessment tools • Identification of indirect		• MAT 272: Object-oriented Computing • MAT 323: : Operations Research models I • MAT 324: Operations Research models II • MAT 379: Computer Networking • Mat 400: Quantitative Problems in Criminal Justice • MAT 404: Internship in Management Info. Systems

	assessment tools • Initial assessment phase	L2	• MAT 324: Operations Research models II
Fall 2011	• Data collection and assessment	L1, L2, L4	• MAT 272 – L1, L2, L4 • MAT 323 – L2 • MAT 379 – L1, L2 • MAT 400 – L1, L2, L4
Spring 2012	• Data collection and assessment	L1, L2, L3, L4. L5	• MAT 324 – L2, L3, L4 • MAT 379 – L1. L2. L3, L4, L5 • MAT 404 – L1, L2, L3, L4, L5
Summer 2012	Analyze data and write report for department		
Fall 2012	• Data collection and assessment	L1, L2, L3, L4, L5	• MAT 272 – L1, L2, L4 • MAT 323 – L2, L3, L4 • MAT 400 – L1, L2, L3, L4, L5
Spring 2013	Start collecting data for next assessment cycle		

IV. Assessment Activities.

The following activities will be conducted to support assessment of program learning objectives.

a. Program outcome assessment data (Direct assessment)

Every semester, a sample of required courses will require students to perform activities that can be used to directly assess program learning objectives. The activities may be projects and paper, tests (midterm, final), homework, laboratory assignments, and/or presentations and they will be part of the students' graded work in the courses. This will ensure that the students will give adequate effort in performing the assessment activity. In addition to the normal grading of these activities as part of the course, the activities will also be marked relative to the appropriate learning objective using scales: Exceeds Expectations (=EE), Meets Expectations (=ME), Approaches Expectations (=AE) and Does not meet expectations (=DE).

Every two years, the CIS major coordinator and the faculties will review this program outcome assessment data and make appropriate changes to the courses and curriculum in order to ensure that the program learning objectives are met.

b. Program Evaluation by Alumni (Indirect assessment)

The Office of Institutional Research of John Jay College of Criminal Justice conducts alumni surveys of students 4 months, 2 years, and 5 years after graduation. The purpose of these surveys is to obtain concerning the education the student received at John Jay. At least once a year the department chairperson and the major coordinator will be responsible for carefully reviewing these evaluations, and for bringing proposed changes to the department for consideration.

c. Supervisor evaluation of internship student (Direct/Indirect assessment)

Many of the students in the computer information systems major program also partake in internship opportunities. For the internship assignment the student will have to use principles, methods and tools covered in foundation CIS major courses. Thus evaluating the student's performance on the internship assignment will give valuable information to the department in regards to how well it's meeting its learning objectives. The department will mail the internship supervisor of the student a questionnaire after the student finishes the internship. The questionnaire will be designed to assess program learning objectives.

d. Transcript data analysis

Starting summer 2012, and every other summer thereafter, the major coordinator will obtain transcripts of graduating students. One purpose of collecting this transcript data is to compile data on student performance in the MAT 400, 404 sequences mentioned previously in this document. Another reason for collecting the transcript data is to assess how the courses in the major coordinate with each other.

Appendix A
Curriculum Map

Program Learning Objectives Computer Information Systems (CIS)					
	Use and critically evaluate the variety of theoretical approaches that are relevant to CIS	Use and critically evaluate the variety of Practical/ hands-on/ research approaches that are relevant to CIS	Analyze the quality of the programs in Computer Science and Information Systems to enable graduates to be successful in the highly competitive high technology industries and graduate schools	Communicate effectively through integrating theory, research and policy in written reports and presentations	Demonstrate proper business ethics and Professionalism in the proposal or evaluation of solutions to CIS applications
Course Learning Objectives					
Core Courses					
Part 1:	**Computer Foundation Courses**				
MAT 272: Object-oriented Computing	Describe the process by which high level process is deconstructed into a sequence of atomic logical steps. Develop an effective algorithm correspondingly to solve the specific problem.	Design and implement; implement the algorithm using C++ programming language.		Write assignments consisting of design, documented code, and comments to enhance the readability of the program. Communicate effectively through integrating theory, research and implementation in real projects.	

MAT 373: Advanced Data Structures	Use different ways to organize data for easy access and efficient manipulation.	Organize information in computer programs to provide an efficient high-performance computing.	Develop software systems covering a broad range of engineering and scientific applications as a member or leader of a team.	Write assignments consisting of design, documented code, description of testing methodology, critical contemplation of the difficulties faced, possible improvements.	
MAT 374: Programming Languages		Design and implement; programming with different languages. Evaluate efficiency of different programming languages. Compare critical features of different programming languages.	Participate as an effective team member or team leader in the development of large computer and software systems covering a broad range of engineering and scientific applications.	Write a detailed report of laboratory assignments / applications. Present work to peers and evaluate with peers.	
MAT 375: Operating Systems	Identify and explain the mechanisms by which an OS provides support for: processes, memory, files, interrupts, concurrency and synchronization, deadlock, security and protection. Describe contemporary operating systems and their security vulnerability and counter-measures.	Write programming assignments illustrating the use and implementation of the concepts through labs.	Prepare for professional careers in leading roles including, but not limited to, the following: systems developer, system administrator, systems security, kernel-level programmer, system analyst, by learning how contemporary operating systems are developed and managed and what makes a system vulnerable.	Evaluate research proposal; Write organized research survey article; Present the new findings; Write Project/ assignments consisting of design, documented codes and analysis.	Use information effectively to accomplish a specific purpose, ethically and legally. (e.g., demonstrate critical interpretation of required readings; and/or effective searching of appropriate discipline specific bibliographic databases; and/or primary data gathering by observation and experimentation;

					and/or finding and evaluating Internet resources.)
MAT 377: Computer Algorithms	Describe the process to analyze an algorithm theoretically. Describe the process to compare and classify different algorithms according to their asymptotic growth rate of the time function.	Optimize implementation by using appropriate data structures, by using appropriate storing and processing of input data. Design and implement assignments to identify procedures that would slow down the execution time of a program.	Explain the efficiency of a solution (algorithm). Assess the cost of using a particular solution over another.	Evaluate solution proposal; Design and analyze algorithms of your own and peers. Participate in group projects and activities.	
Part 2:	**Operations Research Requirement**				
MAT 323-324: Operations Research Models I and II		Illustrate the use and implementation of the concepts through labs.	Assess the efficiency of solution design and implementation.	Communicate effectively through integrating theory, research and policy in written reports/homework	
Computer Elective Courses (a subset of the courses taken)					

MAT 270: Security of Computers and Their Data	Analyze attack and defense models. Analyze various processes of loopholes in computer security and learn the basic vulnerabilities.	Design and implement methods to detect attacks, frauds, security loopholes. Design and implements procedures to defend against malicious attacks.	Explain how the computer systems are managed and secured. Prepare for professional careers in leading roles including, but not limited to, the following: Digital forensic, system administration, Criminal justice, Forensic computing.		Use information effectively to accomplish a specific purpose, ethically and legally. (e.g., demonstrate critical interpretation of required readings; and/or effective searching of appropriate discipline specific bibliographic databases; and/or primary data gathering by observation and experimentation; and/or finding and evaluating Internet resources.)
MAT 379: Computer Networking	Analyze the principles and methodologies used in the modern computer networks and networked information systems.	Design and implement methodologies for modern computer networks to illustrate the application of concepts.	Maintain a continuing understanding of the trends and needs of the modern networks, practices and the broad areas of contemporary research efforts.	Communicate effectively through integrating theory, research and results in technical reports.	Demonstrate the awareness of ethical perspectives and concepts.
<u>Capstone Courses</u>					
MAT 400: Quantitative Problems in Criminal Justice	Understand goals of different stages of the software engineering cycle: requirements analysis, design, implementation, and quality	Engage in small group software development projects, using a commercially viable language (e.g. C#, Java, Ruby-Rails, etc.)	Describe how to maintain a continuing understanding of the trends and needs of the software engineering job market, and the broad areas of	Become familiar with industry standards for software documentation (e.g. UML) or both clients, and peer software developers.	Become aware of basic intellectual property issues, plagiarism, derivative works, and licensing,

	assurance.		contemporary Computer Science research efforts.		
MAT 404: Internship in Management Information Systems	Understand the interplay of technological and social competencies in organizational dynamics, and their influence on the success of real world projects.	Be part of a real-world project team whose mission requires aspects of software design, development, and testing.	Provide portfolio items by which the student may illustrate the synthesis of the concepts and skills acquired in the course of completing the major.	Prepare reports that highlight team member contributions to the project, for various audiences, including fellow team members, supervisors, and clients.	Understand, through experience and discussion, the ethical responsibilities of team members to each other, to supervisors, and to their clients.

Appendix B
Rubric for MAT 272: Object-Oriented Programming

Criteria	Exceeds Expectations	Meets Expectations	Approaches Expectations	Does not meet expectations
Describe the process by which high level process is deconstructed into a sequence of atomic logical steps. Develop an effective algorithm correspondingly to solve the specific problem. */*Program Objective (L1): Use and critically evaluate the variety of theoretical approaches that are relevant to CIS*/*	The student can critically analyze a practical problem and break down a large project into a sequence of atomic logic steps correctly. An efficient algorithm can be developed independently to solve the practical problem.	With a little help from the instructor, the student is able to critically analyze a practical problem and break down a large project into a sequence of atomic logic steps correctly. With a little help from instructor, an efficient algorithm can be developed to solve the practical problem.	The student has some trouble in critical thinking. In solving a practical problem, the student is able to analyze a problem critically and break down a large project into a sequence of atomic logic steps, but the student needs help from instructor for the most part. With major hints given by the instructor, the student is able to develop a correct algorithm but not so efficient.	The student has great trouble in critical thinking. With lots of help provided by the instructor, the student still fails to analyze a practical problem critically and cannot break down a large project in a correct way. With lots of help provided by the instructor, the student still has the trouble and fails to develop a correct algorithm.
Design and implement; implement the algorithm using C++ programming language. */*Program Objective (L2): Use and critically evaluate the variety of Practical/ hands-*	The student can translate the designed algorithm in a manner compatible with the syntactic rules of C++ programming language to a bug-free, executable computer program. Control	The student is able to translate the algorithm in a manner compatible with the syntactic rules of C++ programming language to an executable computer program. There may exist some negligible errors (e.g. some warning messages given by the compiler) in the	The student can translate the designed algorithm to a complete program. However, there are some errors in the completed program, including compilation errors and logic errors. With the help from instructor, the student can finally remove all the errors. Control statements	The student fails to finish a complete program based on the designed algorithm. There are quite a few errors in the completed program, including fatal errors and non-fatal errors. Control statements or data structures are consistently misused.

*on/ research approaches that are relevant to CIS */*	statements and data structures are used accurately and efficiently.	completed program. Control statements and data structures are used correctly.	and data structures are used, with some exceptions, used accurately and appropriately.	
Write assignments consisting of design, documented code, and comments to enhance the readability of the program. Communicate effectively through integrating theory, research and implementation in real projects. */* Program Objective (L4): Communicate effectively through integrating theory, research and policy in written reports and oral presentations*/*	Solution technique is carried out accurately without any error. The source codes in the solution program are superbly organized and succinct. Critical comments are made to enhance the readability of the programs. The reader can easily follow the ideas and logic.	The solution technique is carried out accurately with some minor errors. The source codes in the solution program are well organized with mostly a smooth flow. However, the student need make efforts to enhance the readability of the program by adding necessary comments. The reader with a little effort can follow the ideas and logic.	The solution technique is carried out accurately for the most part. The source codes in the solution program have an acceptable degree of organization, but with some awkwardness to the flow. The student definitely needs to add in the program lots of extra comments to improve the readability of the program. Many ideas can be followed, but only with lots of effort.	The solution technique has many inaccuracies. The source codes in the program have minimal organization. Comments are not used at all. Major ideas are lost on the reader due to poor flow of the writing the source codes.

Appendix C
Rubric for MAT 323-324: Operations Research I &II

(In the following rubric OR = Operations Research)

Criteria	Exceeds Expectations	Meets Expectations	Approaches Expectations	Does not meet expectations
Illustrate the use and implementation of the concepts through labs (*Program learning objective L2*: Use and critically evaluate the variety practical/hands-on/research approaches that are relevant to CIS)	The OR problem is set up correctly in a mathematical context. A correct solution to the problem, with an appropriate use of OR techniques learned in the course, is given. Computer software is used flawlessly.	The OR problem is set up correctly in a mathematical context. A complete solution to the problem, with an appropriate use of OR techniques learned in the course is given. However solution contains some small errors, such as a simple computation error. Computer software is used flawlessly.	The OR problem is not represented correctly in a mathematical context. Some parts of a correct solution to the problem is given, but with some key elements missing or some inappropriate elements included. Computer software is used with some error.	The OR problem is not represented correctly in a mathematical context. The attempted solution is no more than some work beyond re-copying data. Work shown will not lead to a correct solution. Computer software is not used appropriately.
Assess the efficiency of solution design and implementation (*Program learning objective L3*: Analyze the quality of the programs in Computer Science and Information systems to enable graduates to be successful in the highly competitive high technology industries and	Presents a thoughtful and critical stance while monitoring contemporary resources where industry and academic issues are discussed. Can produce OR models that can be easily generalized to more complex problems.	Presents a good awareness of contemporary resources where industry and academic issues are discussed. Can produce OR models that can be generalized with some effort, such as adding a few concepts, to more complex problems.	Presents some awareness of the contemporary resources when industry and academic issues are discussed. Produces OR models that are specific to the problem at hand, so cannot be generalized to more complex problems.	Little or no understanding of contemporary industry and academic issues and challenges.

graduate schools)				
Communicate effectively through integrating theory, research and policy in written reports/homework (*Learning objective L4*: Communicate effectively through integrating theory, research and policy in written reports and presentations)	The solution is well organized with a smooth flow. The reader can easily follow the ideas and logic. The report is succinct and grammatically correct. Mathematical terms are used accurately and appropriately.	The solution is well organized with a smooth flow. The reader with a little effort can follow the ideas and logic. The report contains negligible grammatical errors. Mathematical terms are, with at most one exception, used accurately and appropriately.	The solution has some organization, but the flow is disjointed or superfluous. Many ideas can be followed, but requires the reader to fill in some nontrivial details. The report has some grammatical errors. Mathematical terms are used, with a few exceptions, used accurately and appropriately.	The solution has little or no organization. Major ideas are lost on the reader due to poor flow of the writing. There are numerous grammatical errors. Mathematical terms are consistently misused.

Appendix D
Rubric for MAT 379: Computer Networking

Criteria	Exceeds Expectations	Meets Expectations	Approaches Expectations	Does not meet expectations
Analyze the principles and communication methodologies used in the modern computer networks (*Program learning objective L1:* Use and critically evaluate the variety of theoretical approaches)	Identify best practices appropriate for modern computer networks communication methodologies and network protocol stack development and present accurate rationales for choices made; Compare and contrast features of various network designs, and environments identifying appropriate occasions or contexts for their use.	Identify choices for modern computer networks communication methodologies and network protocol stack development providing rationales for such choices. Solutions contain some minor errors, e.g., present most of the error handling cases but not all. Compare and contrast features of some of the network designs, and environments identifying appropriate occasions or contexts for their use.	Can identify and explain methodologies for some simple network systems but cannot explain the methodologies for complex systems. Solutions missing some key protocol elements. With some assistance, compare and contrast features of some of the network designs and environments, attempting to identify occasions or contexts for their use. Important elements are given but details omitted.	Did not acquire understanding of the communication methodologies, protocol stack in modern computer networks. Explanations provided for rationales behind the network designs are inaccurate and inconclusive. Majority of the details are missing. Mixed with other concepts.
Illustrate the application of concepts through design and implementation methodologies (*Program learning objective L2:* Use and critically evaluate the variety of	Without assistance, design and implement network system programs to accomplish variety of communications and security features. Develop comprehensive testing suites to	Design and implement network system programs with some assistance. Programs contain major important features, but lack some minor features. Develop testing	Design and implement network system programs but some functional errors exist. Provide solutions for a subset of the given tasks. Develop testing suits for some use case scenarios but testing suites have some flaws.	Problems are not represented correctly. Design and implementation contain major errors and not functional.

Practical/ hands-on/ research approaches)	prove the correctness of the system.	suites but omit some error handling scenarios.		
Maintain a continuing understanding of the trends and needs of the modern networks, practices and the broad areas of contemporary research efforts. (*Program learning objective L3:* Analyze the quality of the programs in Computer Science and Information Systems to enable graduates to be successful in the highly competitive high technology industries and graduate schools)	Presents a thoughtful and critical stance while monitoring contemporary resources where industry and academic issues are discussed. Presents a proactive and deep understanding of the immediate and long-term issues and challenges involving modern networks and securities.	Presents a good awareness of contemporary resources where industry and academic issues are discussed. Presents good understanding of the current issues but with somewhat limited perspective about long-term factors.	Presents some awareness of the contemporary resources where industry and academic issues are discussed. Moderate understanding of the existing issues and challenges.	Little or no understanding of contemporary industry and academic issues and challenges.
Communicate effectively through integrating theory, research and results in technical reports (*Program learning objective L4:* Communicate effectively through integrating theory, research and policy in written reports and	Articulate ideas clearly and concisely. Organizes written materials in a logical sequence to enhance the reader's comprehension with proper use of computer networking terminologies, diagrams, tables and programs. Programs are properly commented to enhance readability and understanding.	Articulate ideas clearly and concisely. Organizes written materials in a logical sequence to enhance the reader's comprehension. Some minor flaws in diagrams or tables. Programs missing some comments. Grammar and spelling are correct with some	Articulates ideas, but writing is somewhat disjointed, superfluous or difficult to follow. Uses graphs, tables, and diagrams, but only in a few instances they are applied to support, explain or interpret information correctly. Programs missing major comments making it difficult to understand. One or two spelling/grammar errors per page.	Does not articulate the ideas clearly. Key points missing. Little or no structure or organization. Networking terminologies are not used according to the standards. No figures used to explain or interpret information correctly. The

presentations)	Grammar and spelling are correct.	negligent errors.		writing style is inappropriate for the audience and for the assignment.
Demonstrate the awareness of ethical perspectives and concepts (*Program learning objective L5:* Demonstrate proper business ethics and Professionalism)	Able to analyze a complex ethical situation and demonstrate an understanding of major and subtle ethical problems; cite examples of similar but unexplored scenarios.	Able to analyze a complex ethical situation and demonstrate an understanding of major and subtle ethical problems.	Appear to be aware of ethical issues but understanding of some of the complex ethical situations not accurate.	Show no awareness of potential ethical problems in their response.

Appendix E
Rubric for MAT 400: Quantitative Problems in Criminal Justice

Criteria	Exceeds Expectations	Meets Expectations	Approaches Expectations	Does not meet Expectations
Understand goals of different stages of the software engineering cycle: requirements analysis, design, implementation, and quality assurance. (*Program learning objective L1:* Use and critically evaluate the variety of theoretical approaches)	The student understands the distinctions between stages of the lifecycle and can lead a project through these stages.	The student understands the distinctions between stages of the lifecycle and can follow these delineations while working on a project.	The student understands the distinctions between stages of the lifecycle but has difficulty in one or more stages of the process.	The student does not grasp the distinctions between stages of the lifecycle.
Engage in small group software development projects, using a commercially viable language (e.g. C#, Java, Ruby-Rails, etc.) (*Program learning objective L2:* Use and critically evaluate the variety of Practical/ hands-on/ research approaches)	The student can translate the software design into functionally correct and efficient program module using a commercially viable language, and shows competency in one or more supporting technologies.	The student can translate the software design into functionally correct and efficient program module using a commercially viable language. Shows marginal competency in one of the supporting technologies.	The student can translate the software design into program module. However, there are some logical as well as syntactical errors in the implementation.	The student is not competent in writing programs in a commercially viable language.
Describe how to maintain a continuing understanding of the trends and needs of the software	The student demonstrates a thoughtful and critical stance while monitoring electronic resources where industry and	The student is maintaining an awareness of industry and academic issues by regularly monitoring	The student is very sporadically monitoring electronic resources where industry and academic issues are discussed.	The student does not know how to obtain information on industry and academic trends.

engineering job market, and the broad areas of contemporary Computer Science research efforts. (*Program learning objective L3:* Analyze the quality of the programs in Computer Science and Information Systems to enable graduates to be successful in the highly competitive high technology industries and graduate schools)	academic issues are discussed.	appropriate electronic resources.		
Become familiar with industry standards for software documentation (e.g. UML) or both clients, and peer software developers. (*Program learning objective L4:* Communicate effectively through integrating theory, research and policy in written reports and presentations)	The student is adept with several industry standards for software design documentation, and is knowledgeable about the relative strengths and applicability of each.	The student is adept at one standard for software design documentation, and is aware in a broad sense of its limitations and applicability.	The student is familiar with a range of industry standards for software design documentation, but is not capable of producing documents which meet these standards.	The student is not familiar with industry standards for software design documentation.
Become aware of basic intellectual property issues, plagiarism, derivative works, and licensing	The student is aware of historical and current issues surrounding licensing, copyright and related legal and ethical issues in	The student is aware of historical and current issues surrounding licensing, copyright and related legal and ethical issues in	The student is maintaining some awareness of historical issues surrounding licensing, copyright and related legal	The student is not aware of issues surrounding licensing, copyright and related legal and ethical issues in commercialization

(*Program learning objective L5:* Demonstrate proper business ethics and Professionalism)	commercialization of software, and is able to apply these in the context of any software development project without any hint from the instructor.	commercialization of software and with some help from the instructor, is able to apply these in the context of a software development project.	and ethical issues in commercializing of software, and is somewhat aware of where to obtain information about emerging issues.	of software.

Appendix F
Assessment of Learning Objective L2
MAT 324
Spring Semester 2011

Introduction

MAT 324, Operations Research Models II is a three-credit class that is taught during the spring semester each academic year. MAT 324 is the second course in the two semester sequence of Operations Research (OR) courses. The first class in the sequence is MAT 323, Operations Research Models I. The OR sequence is required for CIS majors. The purpose of this sequence is to prepare students for their chosen applied specialization. The applied specializations for the CIS major are the Criminal Justice Applied Specialization and the Public Administration Applied Specialization. For example, students use OR principles and techniques learned in the 323-324 sequence to develop models of public agency functions. Students then analyze these models and consider the organizational and management implications. In MAT 324 the main topics studied are the transportation, assignment and transshipment problems, dynamic programming, the critical path method, nonlinear programming and game theory. In this course the student takes a midterm exam, a final exam, and approximately 10 projects are collected and graded. Some of the projects require the student to use the Solver feature of Microsoft Excel.

Assessment of learning objective L2

L2: Use and critically evaluate the variety of practical/hand-on/research approaches that are relevant to Computer Information Systems.

L2 is assessed using Project #6 - a minimum cost network flow problem. It has two parts, the first part requires the student to set the problem up as a linear programming problem. The second part asks the student to use Microsoft Excel to find the optimal solution for this particular problem. Linear programming is intensely studied in MAT 323.

Project #6 was evaluated on two criteria – The mathematical model of the problem and the use of the Solver feature of Microsoft Excel. Each category was rated on the following scale: Exceeds Expectations (=EE), Meets Expectations (=ME), Approaches Expectations (=AE) and Does not meet expectations (=DE). The rubric used for evaluation is attached to the end of this report.

The following table summarizes our assessment data. For this report we took a sample of 10 project papers.

Project #6		
Student	The quality of the mathematical model	Quality of the use of the Solver feature of Microsoft Excel
1	EE	ME
2	EE	DE
3	ME	ME
4	EE	EE
5	EE	ME
6	ME	ME
7	EE	EE
8	ME	ME
9	ME	AE
10	ME	ME

Findings and Recommendations

Of the 10 students assessed for project #6, most of them at least met expectations in every category. This is not surprising since at this point in the OR sequence students have received a healthy dose of linear programming, and have done a good number of assignments involving Microsoft Excel. One sidebar that comes from this data is that students did learn some of the main ideas from Operations Research I. Student number two produced a perfect, and well thought out, mathematical model of the problem. However, the student did not use the software to obtain an optimal solution. Most students did a good job using mathematical symbolism in writing their model. For example, the decision variables were clearly labeled. However, most students did not explain what the optimal solution was, of how management should implement it. Instead, a good number of students turned in their computer output with the optimal solution circled in pen. In the future the instructor will spend more in class time explaining how to write a report more suitable for reading by upper level management. In particular, write out what the optimal solution is and how to implement it.

This assessment exercise only used one of the twelve graded projects given to the class. It serves as a starting point assessing the learning outcomes of the CIS major. In the future we will assess items from in-class exams and from a larger collection of collected projects.

Overall, the students in the Spring 2011 MAT 324 class is meeting departmental expectation of learning objective two of the Math & Computer Science Department.