KNIGHT FOUNDATION SCHOOL OF
COMPUTING AND INFORMATION SCIENCES

Biennial Assessment Summary 2019-2021
for the
Bachelor of Science in Information Technology

Prepared by
Nagarajan Prabakar – Assessments Coordinator

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I. INTRODUCTION

This report formally written in Fall 2021, is prepared following the intent of the **Assessment Plan** using the **Assessment Mechanisms and Procedures** for the BS in IT Program [based on the similar documents for the BS in CS Program that were adopted initially by the Knight Foundation School of Computing & Information Sciences (then the School of Computer Science) in Spring 2003, with the last version approved in Spring 2015]. Its purpose is to summarize the results of the various assessment mechanisms utilized by KFSCIS in support of the BS in Information Technology program and present the resulting findings and recommendations to the Undergraduate Committee, the Undergraduate Program Director, the Faculty of the School, and the Director.

The goals of the assessment process are to assess the extent to which the Student Outcomes and Program Educational Objectives of the BS in Information Technology program have been attained in the period under review, to identify specific areas of the program where a need for improvement is indicated, and to present a set of recommendations for achieving those improvements.

This first-time review was conducted for the period Summer 2019 to Spring 2021.

Important Note: During this assessment period, the School received a substantial donation from the Knight Foundation. Accordingly, the name of the School was changed from SCIS to KFSCIS.

II. OVERVIEW

A. Terminology

The BS in Information Technology *Program Educational Objectives* (Appendix A-1) document describes the overriding goals of the program relating to the cumulative persistent effects of the students' educational experiences. The objectives are broad and define the expected general characteristics of the program's graduates within some years after graduation.

The BS in Information Technology *Student Outcomes* (Appendix A-2) are more specific in nature. These describe characteristics of students at the time of graduation, and define the specific knowledge, skills, and behaviors that they are expected to acquire as they complete the requirements of the program. Attainment of each Student Outcome enables the attainment of one or more of the Program Educational Objectives.

The syllabus of each required and elective course of the BS in Information Technology program presents a set of *Course Outcomes*. The Course Outcomes identify specific knowledge units and levels of attainment (e.g., mastery, familiarity, awareness) expected of a student completing the course. Attainment by students of Course Outcome enables attainment of one or more of the Student Outcomes.

B. Assessment Mechanisms & Procedures

Consistent with current educational practice, KFSCIS follows a systematic process of collecting and utilizing data on the degree of attainment of the Student Outcomes and Program Educational Objectives. The *KFSCIS Assessment Plan* (Appendix B-1) specifies the participants and schedule for this process, and the means of evaluating the data and enacting program changes indicated by the evaluation. The *KFSCIS Assessment Mechanisms & Procedures* document (Appendix B-2) specifies the implementation of the Assessment Plan.

The following indirect assessment mechanisms have been employed in this assessment cycle:

Mechanism	**Target**	**Frequency**
Course Outcomes Survey by Students	Course Outcomes	Semester
Course Outcomes Survey by Instructors	Course Outcomes	Semester
Graduating Student (Exit) Survey	Student Outcomes	Semester
Alumni Survey	Program Educational Objectives	Continual
IAB Members and Employers Survey	Program Educational Objectives	Continual

In this assessment cycle, no direct assessment data are included since KFSCIS has begun the following direct assessment process from Fall 2021 for the BS in Information Technology program:

Mechanism	**Target**	**Frequency**
Course Embedded Assessment	Course Outcomes and Student Outcomes	At least once in the Assessment Period

Additional input is solicited and may be received from other program constituents including:

- ACM Student Chapter,
- Upsilon Pi Epsilon Honor Society Chapter,
- KFSCIS Women in Computer Science group,
- STARS Student Chapter,
- Programming Team,
- Google Developers Club, and
- KFSCIS Industry Advisory Board.

C. Process

The required and elective courses of the BS in Information Technology are each assigned, based on subject area, to one of nine groups: Application Development, Computer Organization, Database, Foundations, Network, Professional Development, Programming, Security, and Systems.

Each subject area group is managed by a faculty Subject Area Coordinator (SAC). Periodically, the assessment data and comments from Student and Instructor Course Outcome Surveys are considered by the Subject Area Coordinators. These provide the information for the Subject Area Coordinators' reports.

The SAC reports and assessment data from all other sources are evaluated by the KFSCIS Assessments Coordinator whose evaluations and recommendations are presented in an assessment report.

The assessment report is considered by the KFSCIS Undergraduate Committee, and by the KFSCIS Undergraduate Program Director. The Undergraduate Committee's curricular recommendations are presented to the KFSCIS faculty for approval. Responsibility for enactment of approved recommendations rests with the KFSCIS Undergraduate Program Director.

III. DATA

A. Course Outcomes Survey by Students

This survey is completed by students in each section of a required or elective IT class. For each course outcome, the student states the extent to which (s)he agrees with the following two assertions:

1: *I believe that this is a valuable outcome for this course*, and
2: *The subject matter of this outcome was covered adequately in class*

To each assertion, the student responds on a 5-point scale as follows:

5: I agree strongly, 4: I agree moderately, 3: I am not sure, 2: I disagree moderately, 1: I disagree strongly

For each outcome, a weighted mean of the responses to each question is calculated. The means are provided for each course, cumulatively over all semesters of the period under review.

BS in Information Technology Required or Elective Course		# Responding	Value of Outcome	Coverage Adequacy
CDA 3102	Computer Architecture	47	4.37	4.36
CEN 3721	Intro to Human-Computer Interaction	26	4.33	4.11
CGS 1920	Introduction to Computing	23	4.82	4.66
CGS 3095	Technology in the Global Arena	72	4.72	4.66
CGS 3767	Computer Operating Systems	30	4.14	3.46
CGS 4285	Applied Computer Networking	18	4.44	3.90
CGS 4854	Website Construction Management	16	3.82	3.63
CIS 4365	Enterprise Cybersecurity Policies and Practices	10	4.75	4.34
CIS 4431	IT Automation	19	4.37	4.36
CNT 4182	Mobile and IoT Cybersecurity Policies and Practices	12	4.96	4.85
CNT 4403	Computing and Network Security	11	4.52	4.50
CNT 4513	Data Communications	48	4.58	4.53
CNT 4504	Advanced Network Management	7	4.83	4.86
CNT 4603	Windows System Administration	NO	DATA	AVAILABLE
COP 2210	Computer Programming I	59	4.75	4.59
COP 2250	Programming in Java	18	4.34	4.06
COP 3337	Computer Programming II	76	4.33	3.89
COP 3530	Data Structures	52	4.55	4.30
COP 3804	Intermediate Java	19	4.51	3.84
COP 4005	Windows Programming for IT	10	4.55	4.55
COP 4338	Systems Programming	56	4.18	3.54

COP 4655	Mobile Application Development	5	4.04	3.68
COP 4703	Information Storage & Retrieval	22	4.35	4.20
COP 4751	Advanced Database Management	7	4.36	4.43
COP 4813	Web Application Programming	10	4.30	4.08
COP 4814	Component-Based Software Dev	20	4.45	3.83
COT 3100	Discrete Structures	92	4.77	4.04
CTS 4348	Unix System Administration	7	4.47	3.93
CTS 4408	Database Administration	12	4.42	4.48
CTS 4743	Enterprise IT Troubleshooting	17	4.91	4.88
		=====	=====	=====
		774	4.52	4.19

Table 1: Value & Adequacy of Coverage of Course Outcomes 05/19 – 04/21

Notes: (1) In this assessment cycle, MAD-1100/MAD-2104 is almost completely replaced by COT-3100. MAD-1100 and MAD-2104 were taught by the Department of Mathematics whereas COT 3100 is taught by KFSCIS, and hence, we have Student Course Outcomes available for this required course. (2) *The overall scores for Value of Outcomes (4.52) and Coverage Adequacy (4.19).* (3) Since CNT 4603 course was not offered in this Assessment cycle, no data is available. (4) The new courses offered in this cycle based on the curriculum changes are COP 4751 (replaces COP 4722), and CTS 4408.

The semester data for each course (**RV designation is for Online sections of courses**) are presented here grouped under the nine subject areas. The Subject Area Coordinator (SAC) reports are included in Appendix C.

Subject Area: Application Development -- (SAC: Antonio Hernandez)

CEN 3721 Introduction to Human-Computer Interaction
COP 4005 Windows Programming for IT
COP 4655 Mobile Application Development
COP 4813 Web Application Programming
COP 4814 Component-Based Software

Table 2- CEN 3721: Student Rating of Course Outcomes

CEN 3721 – Introduction to Human-Computer Interaction

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019 - RV	6	4.43	4.34
Fall 2019 - RV	3	2.62	2.50
Spring 2020	6	4.65	4.17
Summer 2020 - RV	1	4.00	3.62
Fall 2020	2	4.88	4.44
Spring 2021	8	4.56	4.48
	=======	=======	=======
	26	4.33	4.11

Table 2-COP 4005: Student Rating of Course Outcomes

COP 4005 Windows Programming for IT

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	3	4.91	4.92
Fall 2019 - RV	1	2.75	3.00
Spring 2020 - RV	1	3.88	3.88
Summer 2020 - RV	2	4.69	4.50
Spring 2021 - RV	3	4.92	4.96
	=======	=======	=======
	10	4.55	4.55

Table 2-COP 4655: Student Rating of Course Outcomes

COP 4655 – Mobile Application Development

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019 - RV	1	3.00	3.40
Fall 2019	1	5.00	4.20
Spring 2020	1	2.20	2.20
Summer 2020 - RV	2	5.00	4.30
	=======	=======	=======
	5	4.04	3.68

Table 2-COP 4813: Student Rating of Course Outcomes

COP 4813 – Web Application Programming

	# Responding	Value of Outcome	Coverage Adequacy
Fall 2019 - RV	3	3.93	3.78
Spring 2020 - RV	1	5.00	3.78
Fall 2020 - RV	2	3.39	3.44
Spring 2021 - RV	4	4.86	4.69
	=======	=======	=======
	10	4.30	4.08

Table 2-COP 4814: Student Rating of Course Outcomes

COP 4814 – Component-Based Software

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	2	5.00	3.50
Fall 2019	1	5.00	5.00
Fall 2020	4	3.88	3.92
Spring 2021 – RV	13	4.50	3.76
	=======	=======	=======
	48	4.73	4.69

Subject Area: Computer Organization (SAC: Dong Chen)

CDA 3102 Computer Organization

Table 2- CDA 3102: Student Rating of Course Outcomes

CDA 3102 – Computer Organization

	# Responding	Value of Outcome	Coverage Adequacy
Fall 2020	1	3.71	4.29
Spring 2021	46	4.39	4.36
	=======	=======	=======
	47	4.37	4.36

Subject Area: Database (SAC: Antonio L Bajuelo)

COP 4703 Information Retrieval Concepts
COP 4722 Survey of Database Systems
COP 4751 Advanced DB Management
This new course replaces COP 4722 starting in Spring 2021
CTS 4408 Database Administration

Table 2-COP 4703: Student Rating of Course Outcomes

COP 4703 – Information Retrieval Concepts

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019 - RV	7	4.09	4.20
Fall 2019	3	4.80	4.80
Spring 2020	4	3.95	3.75
Fall 2020	1	5.00	4.80
Spring 2021	7	4.55	4.11
	=======	=======	=======
	22	4.35	4.20

Table 2- COP 4722: Student Rating of Course Outcomes

COP 4722 – Survey of Database Systems

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	1	4.80	4.60
Fall 2019 - RV	5	4.48	4.36
Spring 2020 - RV	3	3.07	3.33
Fall 2020 - RV	2	4.00	4.20
	=======	=======	=======
	11	4.04	4.07

Table 2-COP 4751: Student Rating of Course Outcomes

COP 4751 -- Advanced DB Management

	# Responding	Value of Outcome	Coverage Adequacy
Spring 2021	7	4.36	4.43
	=======	=======	=======
	7	4.36	4.43

Table 2- CTS 4408: Student Rating of Course Outcomes

CTS 4408 -- Database Administration

	# Responding	Value of Outcome	Coverage Adequacy
Fall 2019 - RV	3	4.67	4.67
Spring 2020	1	3.86	5.00
Summer 2020 - RV	2	4.36	4.43
Fall 2020 - RV	2	4.36	4.36
Spring 2021	4	4.43	4.29
	=======	=======	=======
	12	4.42	4.48

Subject Area: Foundations (SAC: Hadi Amini)

COT 3100 Discrete Structures

Table 2- COT 3100: Student Rating of Course Outcomes

COT 3100 – Discrete Structures

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	6	4.69	4.69
Fall 2019	6	4.93	4.84
Spring 2020	8	4.38	3.91
Summer 2020 - RV	4	4.64	4.18
Fall 2020	5	4.69	4.61
Spring 2021	63	4.82	3.86
	=======	=======	=======
	92	4.77	4.04

Subject Area: Network (SAC: Deng Pan)

CGS 3767 Computer Operating Systems
CGS 4285 Applied Computer Networking
CNT 4504 Advanced Network Management
CNT 4513 Data Communications

Table 2- CGS 3767: Student Rating of Course Outcomes

CGS 3767 – Computer Operating Systems

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	4	3.22	3.21
Fall 2019	1	4.43	3.43
Spring 2020	14	4.48	3.33
Summer 2020 - RV	2	4.70	3.64
Fall 2020	2	2.15	2.21
Spring 2021	7	4.35	4.18
	=======	=======	=======
	30	4.14	3.46

Table 2- CGS 4285: Student Rating of Course Outcomes

CGS 4285 – Applied Computer Networking

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	4	4.30	3.97
Fall 2019	3	4.97	4.66
Spring 2020 - RV	1	2.18	2.73
Summer 2020 - RV	2	4.41	4.43
Fall 2020 - RV	1	5.00	5.00
Spring 2021	7	4.53	3.40
	=======	=======	=======
	18	4.44	3.90

Table 2- CNT 4504: Student Rating of Course Outcomes

CNT 4504 – Advanced Network Management

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	1	5.00	5.00
Fall 2019	1	5.00	5.00
Spring 2021	5	4.76	4.80
	=======	=======	=======
	7	4.83	4.86

Table 2- CNT 4513: Student Rating of Course Outcomes

CNT 4513 – Data Communications

	# Responding	Value of Outcome	Coverage Adequacy
Fall 2019 - RV	3	4.85	4.78
Spring 2020 - RV	1	4.78	4.78
Fall 2020 - RV	1	4.00	4.00
Spring 2021 - RV	43	4.57	4.52
	=======	=======	=======
	48	4.58	4.53

Subject Area: Professional Development (SAC: Richard Whitaker)

CGS 1920 Introduction to Computing (1 credit)
CGS 3095 Technology in the Global Arena
ENC 3249 Professional and Technical Writing for Computing (Taught by English Department)

Table 2-CGS 1920: Student Rating of Course Outcomes

CGS 1920 -- Introduction to Computing

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019 – RV	14	4.36	4.57
Fall 2019	28	4.89	4.71
Fall 2019 – RV	14	4.86	4.36
Spring 2020	7	4.14	4.14
Spring 2020 – RV	14	5.00	4.79
Fall 2020	21	5.00	4.71
Fall 2020 – RV	7	4.86	4.57
Spring 2021	35	4.76	4.59
Spring 2021 – RV	21	5.00	5.00
	=======	=======	=======
	161	4.82	4.66

Table 2-CGS 3095: Student Rating of Course Outcomes

CGS 3095 – Technology in the Global Arena

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	40	4.95	4.80
Summer 2019 – RV	56	4.68	4.25
Fall 2019 – RV	16	3.93	4.33
Spring 2020	56	4.84	4.84
Summer 2020 – RV	8	5.00	5.00
Fall 2020	24	5.00	5.00
Fall 2020 – RV	8	4.12	4.25
Spring 2021	136	4.92	4.90
Spring 2021 – RV	232	4.73	4.62
	=======	=======	=======
	576	4.78	4.69

Subject Area: Programming (SACs: Maria Charters and Janki Bhimani)

CGS 4854 Website Construction Management
COP 2210 Computer Programming I
COP 2250 Programming in Java
COP 3337 Computer Programming II
COP 3530 Data Structures
COP 3804 Intermediate Java
COP 4338 Systems Programming

Table 2- CGS 4854: Student Rating of Course Outcomes

CGS 4854 – Website Construction Management (Maria Charters)

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	3	3.62	3.71
Fall 2019	4	4.14	3.38
Spring 2020 - RV	1	1.00	1.00
Spring 2021	8	4.09	4.06
	=======	=======	=======
	16	3.82	3.63

Table 2- COP 2210: Student Rating of Course Outcomes

COP 2210 – Computer Programming I (Janki Bhimani)

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	8	4.71	4.75
Fall 2019	7	4.67	4.08
Spring 2020	4	4.98	4.82
Summer 2020 - RV	11	4.59	4.40
Fall 2020	2	4.60	4.60
Spring 2021	27	4.82	4.71
	=======	=======	=======
	59	4.75	4.59

Table 2- COP 2250: Student Rating of Course Outcomes

COP 2250 – Programming in Java (Maria Charters)

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	3	4.13	3.70
Fall 2019	4	4.45	3.98
Summer 2020 - RV	2	3.70	3.80
Fall 2020	3	4.70	3.93
Spring 2021	6	4.40	4.44
	=======	=======	=======
	18	4.34	4.06

Table 2- COP 3337: Student Rating of Course Outcomes

COP 3337 – Computer Programming II (Janki Bhimani)

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	10	4.42	3.76
Fall 2019	8	4.64	4.05
Spring 2020	15	3.71	3.54
Summer 2020 - RV	4	4.85	3.43
Fall 2020	7	3.61	2.61
Spring 2021	32	4.60	4.38
	=======	=======	=======
	76	4.33	3.89

Table 2- COP 3530: Student Rating of Course Outcomes

COP 3530 – Data Structures (Janki Bhimani)

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	4	4.93	4.75
Fall 2019	10	4.92	4.43
Spring 2020	5	4.63	4.54
Summer 2020 - RV	2	4.43	4.57
Fall 2020	4	3.79	2.85
Spring 2021	27	4.47	4.34
	=======	=======	=======
	52	4.55	4.30

Table 2- COP 3804: Student Rating of Course Outcomes

COP 3804 – Intermediate Java (Maria Charters)

	# Responding	Value of Outcome	Coverage Adequacy
Fall 2019	4	4.72	3.83
Spring 2020	4	4.25	3.88
Fall 2020	5	4.60	4.55
Spring 2021	6	4.48	3.23
	=======	=======	=======
	19	4.51	3.84

Table 2- COP 4338: Student Rating of Course Outcomes

COP 4338 – Systems Programming (Janki Bhimani)

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019	7	4.04	3.00
Fall 2019	8	4.45	3.80
Spring 2020	4	4.64	4.57
Summer 2020 - RV	1	5.00	4.43
Fall 2020	2	4.36	4.07
Spring 2021	34	4.05	3.42
	=======	=======	=======
	56	4.18	3.54

Subject Area: Security (SAC: Amin Kharraz)

CIS 4365 Enterprise Cybersecurity Policies and Practices
CNT 4182 Mobile and IoT Cybersecurity Policies and Practices
CNT 4403 Computing and Network Security

Table 2-CIS 4365: Student Rating of Course Outcomes

CIS 4365 -- Enterprise Cybersecurity Policies and Practices

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019 – RV	3	5.00	4.67
Fall 2019 – RV	3	4.58	4.13
Spring 2020	2	4.69	3.81
Fall 2020 – RV	1	5.00	5.00
Spring 2021	1	4.38	4.38
	=======	=======	=======
	10	4.75	4.34

Table 2- CNT 4182: Student Rating of Course Outcomes

CNT 4182 -- Mobile and IoT Cybersecurity Policies and Practices

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019 – RV	4	5.00	4.75
Fall 2019	4	4.89	4.81
Summer 2020 - RV	3	5.00	5.00
Fall 2020 – RV	1	5.00	5.00
	=======	=======	=======
	12	4.96	4.85

Table 2 - CNT 4403: Student Rating of Course Outcomes

CNT 4403 -- Computing and Network Security

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019 – RV	1	4.00	3.78
Fall 2019	4	4.70	4.75
Spring 2020	3	4.67	4.63
Summer 2020 - RV	1	4.00	3.78
Fall 2020 – RV	2	4.45	4.50
	11	4.52	4.49

Subject Area: Systems (SAC: Kianoush Gholamiboroujeni)

CIS 4431 IT Automation
CNT 4603 Windows System Administration
The course was not offered during the evaluation period.
CTS 4348 Unix System Administration
CTS 4743 Enterprise IT Troubleshooting

Table 2 - CIS 4431: Student Rating of Course Outcomes

CIS 4431 – IT Automation

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019 – RV	2	4.75	4.83
Fall 2019 – RV	6	4.49	4.44
Fall 2020 – RV	2	2.50	2.50
Spring 2021 – RV	9	4.63	4.61
	=======	=======	=======
	19	4.37	4.36

Table 2 - CTS 4348: Student Rating of Course Outcomes

CTS 4348 – Unix System Administration

	# Responding	Value of Outcome	Coverage Adequacy
Summer 2019 – RV	2	4.75	4.83
Fall 2019 – RV	6	4.49	4.44
Fall 2020 – RV	2	2.50	2.50
Spring 2021 – RV	9	4.63	4.61
	=======	=======	=======
	19	4.37	4.36

Table 2 - CTS 4743: Student Rating of Course Outcomes

CTS 4743 – Enterprise IT Troubleshooting

	# Responding	Value of Outcome	Coverage Adequacy
Spring 2021	17	4.91	4.88
	=======	=======	=======
	17	4.91	4.88

B. Course Outcomes Survey by Instructors

This survey, called the Instructor Course Appraisal (ICA), is completed by each instructor of a required or elective CS course section.

- The instructor separately rates the individual course outcomes in respect of two criteria
  Appropriateness: *Essential* *Very Appropriate* *Appropriate* *Inappropriate*
  Coverage: *Extensive* *Adequate* *Not Enough* *Not At All*
- The instructor separately rates the course prerequisites in respect of two criteria
  Relevance: *Irrelevant* *Incidental* *Useful* *Highly Useful*
  Student Mastery: *Good* *Adequate* *Deficient* *Non-existent*
- The Instructor rates the students' overall preparation for taking the course
  Student Preparation: *Good* *Adequate* *Deficient* *Non-existent*
- In addition, the instructor may append general comments and suggestions specific to each course prerequisite or outcome.

These responses, comments and suggestions from the ICAs, together with the data from the Student Course Outcomes surveys (see **Table 1**) and student comments, form the basis of the Subject Area Coordinators' reports. The summaries included in this section are mostly based on these SAC reports, with occasional augmentation directly from the ICAs. As noted in the preceding section, the complete SAC reports from which these observations are taken are included in Appendix C.

Note: The data here are qualitative; no numeric scores are assigned to responses.

Subject Area: Application Development -- (SAC: Antonio Hernandez)

CEN 3721 Introduction to Human-Computer Interaction

- An instructor recommended a 2nd HCI course for either IT students or CS students, but that view was not expressed by others.
- No change in the curriculum or outcomes is suggested.

COP 4005 Windows Programming for IT

- In faculty appraisals, it was mentioned that students have limited programming skills.
- Evaluation at the department level might be necessary to determine whether previous courses develop in students the programming skills required by this course.

COP 4655 Mobile Application Development

- The course coverage adequacy statistic seems somewhat low and the student participation in the survey was very low. Hence it is difficult to use this statistics to assess whether this is an area of potential improvement.
- A student mentioned "the class itself felt as if we needed a previous class (say, Swift 1) that covered Swift's basics", which could be used as a hint of what to be looking for.
- In faculty appraisals, it was mentioned that students have poor OO development skills.

- Evaluation at the department level might be necessary to determine whether previous courses develop in students the programming skills required by this course.

COP 4813 Web Application Programming
- In faculty appraisals, it was mentioned by an instructor that skills in Web site development were deficient; these are acquired in a prereq course.
- Consider inclusion of review lecture/materials on Web site development.

COP 4814 Component-Based Software Development
- While the course coverage adequacy statistic appears somewhat low, student comments in the survey do not seem significant to determine coverage adequacy is an area of potential improvement.
- No significant concerns are inferred from faculty appraisals.
- It is essential that all assignments and tests provide students with the list of objectives being evaluated or approached. Students then can effectively assess the completion of the course objectives.

Subject Area: Computer Organization (SAC: Dong Chen)

CDA 3102 Computer Architecture
- For all five outcomes of the course, most of the students (80%) agree either strongly or moderately. There is no significant concern expressed by the students or faculty.
- Continue the use interactive textbooks (Zybooks) and in the new course CDA-3102 since ZyBooks was helpful in improving student learning.

Subject Area: Database (SAC: Antonio L Bajuelos)

COP 4703 Information Retrieval Concepts
- Students suggested the inclusion of more practical hands-on applications of the theory covered in class.
- One instructor consistently indicated that other prerequisite outcomes that might help students to be better prepared for this class: Basic understanding of Client/Server model.

COP 4722 Survey of Database Systems
- Some students expressed a concern about sharing the work in group projects and the credit for each team member.
- There is no significant concern expressed by the students or faculty.
- In the past, one instructor consistently indicated that the objective "Object-Oriented Database" and "Spatial and Multimedia Databases" as inappropriate. It is recommended that two outcomes of this course need to be discussed and possibly readjusted.

COP 4751 Advanced Database Management

New course to replace COP 4722 starting in Spring 2021

- No change is suggested on the course outcomes or syllabus.

CTS 4408 Database Administration

- There is no significant concern expressed by the students or faculty.
- One instructor indicated that will be helpful if students are familiar with SQL and database principles and COP - 4703 will be very relevant (Prerequisite Outcome Suggestion/Recommendation)

Subject Area: Foundations (SAC: Hadi Amini)

COT 3100 Discrete Structures

- For all seven outcomes of the course, most of the students (more than 80%) agree either strongly or moderately. There is no significant concern expressed by the students or faculty, except for one of the online sessions that students asked for more time for the exams. Zybooks lends itself as a valuable resource. Some instructors raised the concern for deficient skills in MAC-1105, COP-2210, and/or COP-2250 during the first week of the semester. Instructors are encouraged to evaluate the students' understanding of the prerequisite materials during the first week of semester and provide additional resources to student who have lack of required knowledge.
- No change is needed on the course outcomes or syllabus.
- As some instructors raised the concern for deficient skills in MAC-1105, COP-2210, and/or COP-2250 during the first week of the semester; Instructors are encouraged to evaluate the students' understanding of the prerequisite materials during the first week of semester and provide additional resources to student who have lack of required knowledge.

Subject Area: Network (SAC: Deng Pan)

CGS 3767 Computer Operating Systems

- Out of the seven outcomes of the course, 33% or more students think that the following outcomes are inadequately covered:
    - Be familiar with the use of text editors.
    - Master basic command line functions.
    - Master simple shell programming
- Students complained that the course materials based on Windows 7 were outdated, and asked for more hands-on projects.
- Instructor recommendations included more programming preparation for students and tutoring resources.
- Update the textbook with the state-of-the-art OSs.
- Add coverage for use of text editors, basic command line functions, and shell programming.
- Add more hands-on projects.

CGS 4285 Applied Computer Networking

- Students requested more hands-on projects, especially group projects, and complained that the course was too difficult for a summer semester with only six weeks.
- An instructor indicated that some course outcomes were inappropriate.
- Add more hands-on practice.
- Avoid scheduling the course for a mini semester with six weeks.
- The course outcomes should be reviewed and updated.

CNT 4513 Data Communications

- Multiple students requested more hands-on projects, especially Wireshark labs.
- An instructor suggested more focus on web programming.
- Add more hands-on projects, especially Wireshark labs.
- The course outcomes should be reviewed and updated. Some outcomes, such as the ATM protocols is outdated and should be removed.

CNT 4504 Advanced Network Management

- There is no significant concern expressed by the students or faculty.

Subject Area: Professional Development (SAC: Richard Whitaker)

CGS 1920 Introduction to Computing (1 credit)

- The faculty members that have taught this course have discussed changing the title of this course to "Introduction to the Field of Computing". This should be considered by the UPC.
- No other changes are recommended.

CGS 3095 Technology in the Global Arena

- A few students commented that the textbook was not helpful for the course.
- No other changes are recommended.

ENC 3249 Professional and Technical Writing for Computing (Taught by English Department)

- Using the CGS 3095 course which has writing assignments as a proxy, students' writing skills were found to range from deficient to adequate.
- No changes are recommended.

Subject Area: Programming (SAC: Maria Charters and Janki Bhimani)

CGS 4854 Website Construction Management (Maria Charters)

- There was a concern expressed by several students in the Students Suggestions section, requesting that the course be updated to include current topics.
- Evaluate and select a more modern textbook to aid in providing more current topics. Consider an interactive textbook such as zyBooks that may enable improved student learning. Also consider creating 2 courses out of this one, where one course is dedicated to an overview of full-stack development, specializing in front-end development tools, and the other course is dedicated to back-end development.

COP 2210 Computer Programming I (Janki Bhimani)

- For all ten outcomes of the course, most of the students (80%) agree either strongly or moderately. There is no significant concern expressed in the Students Suggestions section.
- Continue the use interactive textbooks (Zybooks) and ZyLabs along with the lectures handouts, since they were helpful in improving student learning.

COP 2250 Programming in Java (Maria Charters)

- Students expressed concern about the amount and speed of topics covered.
- Provide students with additional lab time where students can have more hands-on practice and support from the instructor and peer learning assistants.

COP 3337 Computer Programming II (Janki Bhimani)

- For all ten outcomes of the course, most of the students (more than 80%) agree either strongly or moderately. Students expressed a big learning gap between Programming 1 and 2. Many students find Programming 2 tougher than Programming 1.
- No change is needed on the course outcomes or syllabus.

COP 3530 Data Structures (Janki Bhimani)

- For all ten outcomes of the course, most of the students (80%) agree either strongly or moderately. There is no significant concern expressed in the Students Suggestions section.
- Continue the use interactive textbooks (Zybooks) and ZyLabs along with the lectures handouts, since they were helpful in improving student learning.

COP 3804 Intermediate Java (Maria Charters)

- The main concern expressed by students was the selection of the textbook by the instructor and the lack of additional support from peer learning assistants.
- A specific textbook should be used by all instructors of COP-3804, with preference given to an interactive textbook such as zyBooks that provides students with more hands-on practice. Also, additional lab time should be provided to students so they can have more hands-on practice with support from the instructor and peer learning assistants.

COP 4338 Systems Programming (Janki Bhimani)

- For all seven outcomes of the course, most of the students (more than 80%) agree either strongly or moderately. Students requested to have more online sessions for this course and reduce homeworks.
- No change is needed on the course outcomes or syllabus.

Subject Area: Security (SAC: Amin Kharraz)

CIS 4365 Enterprise Cybersecurity Policies and Practices

- Student contribution to the report was not significant. However, those who took part in the survey were satisfied with the teaching style and teaching quality.
- Continue to use topics such as cloud security, threat modeling in different context in the enterprise setting (e.g., software, cloud environment, physical security). I would also add topics such as data breaches (i.e., case studies, root causes), password management at the enterprise level.

CNT 4182 Mobile and IoT Cybersecurity Policies and Practices

- There is also no significant concern expressed by the students.
- It is not clear to me how successful the group projects are as the number of the number participants in the survey is small. If the number of students in the class is low, some solo projects would be good. Also, it would be good to expose students to the notion of malicious code, evasion, and malware (e.g., Mirai botnet) in IoT and Mobile ecosystem.

CNT 4403 Computing and Network Security

- The course is offered by multiple instructors. I do not have any updates on the course syllabus as it looks good. I highly encourage the instructors to follow the syllabus and make sure they will deliver the materials promised to students. Moving forward, as we invest more hybrid modality, I encourage the instructors to make use of all the available resources and assist students.

Subject Area: Systems (SAC: Kianoush Gholamiboroujeni)

CIS 4431 IT Automation

- There is no significant concern expressed in the Students Suggestions section.

CNT 4603 Windows System Administration

The course was not offered during the evaluation period.

CTS 4348 Unix System Administration

- There is no significant concern expressed in the Students Suggestions section. One instructor suggested that students need more exposure to Linux and hands on experience.
- It would be great if students get exposure to Linux and hands-on experience either before this class or the syllabus of this course includes some introduction to Linux file system, bash terminal etc. at the first few weeks of this class.

CTS 4743 Enterprise IT Troubleshooting

- There is no significant concern expressed by the students or faculty.
- No change is needed on the course outcomes or syllabus.

C. Graduating Student (Exit) Survey of Student Outcomes

The Student Outcomes Survey is completed by students in the semester in which they expect to graduate. Each student rates each outcome with respect to two criteria, attainment and relevance.

Attainment: *This program outcome has been met for me personally*

5: I agree strongly	*2: I disagree somewhat*
4: I agree moderately	*1: I disagree moderately*
3: I agree somewhat	*0: I disagree strongly*

Relevance: *How meaningful do you consider this outcome to be for you personally?*

5: Extremely meaningful	*2: Somewhat meaningless*
4: Moderately meaningful	*1: Moderately meaningless*
3: Somewhat meaningful	*0: Extremely meaningless*

Data were collected (number of responses is in parenthesis) for Summer 2019 (3), Fall 2019 (unavailable), Spring 2020 (10), Summer 2020 (6), Fall 2020 (10), and Spring 2021 (7) for a total of 36 responses during the period of this assessment. Raw data and statistics calculations for each semester are presented in Appendix D-1. The summary of the whole is presented in Appendix D-2.

The following table summarizes the responses of 36 graduating students completing the survey between summer 2019 and spring 2021. The mean responses are expressed as percentages of 5, the maximum rating. The rating for the outcome "g" is not assessed in the survey since students take interdisciplinary courses (9 credits) from diverse disciplines in the university.

Exit Survey (Graduating Students) 36 Respondents	*Outcome Attainment*		*Perceived Relevance*	
Student Outcomes	*Mean*	*Percentage*	*Mean*	*Percentage*
a) Demonstrate practical hands-on expertise in selection, installation, customizing, and maintenance of the state-of-the-art computing infrastructure	3.64	72.78	4.33	86.64
b) Demonstrate practical proficiency in selection, installation, customizing, and maintenance of the state-of-the-art software systems	3.92	78.32	4.19	83.88
c) Demonstrate general understanding of at least one field where Information Technology plays a central role	4.81	96.12	4.58	91.66
d) Demonstrate understanding of the social and ethical concerns of the practice of Information Technology	4.78	95.55	4.53	90.54
e) Demonstrate the ability to work cooperatively in teams	4.50	89.99	4.67	93.34
f) Demonstrate effective communication skills	4.28	85.54	4.47	89.44
g) Demonstrate familiarity with fundamental ideas and issues in the arts, humanities, and social sciences	N/A	N/A	N/A	N/A
	====	====	====	====
Average Ratings of Student Outcomes	4.32	86.38	4.46	89.25

	====	====	====	====
Overall Satisfaction for IT Areas, Outcomes' a', 'b', 'c', and 'd':	4.22	84.30	4.44	88.88

Table 3: Exit Survey of Attainment & Relevance of Student Outcomes

Assessments surveys from alumni, and employers were CS based objectives that represent the performance of CS, IT, and CY graduates. The survey questions will be refined to identify the performance of graduates from each program from the next assessment cycle.

For the correlation of these survey results from IT perspective, we use the mapping of the CS objectives to the IT program objectives which is shown below.

Mapping between BS-CS Program Objectives to BS-IT Program Objectives

	BS-IT Program Objective					
BS-CS Program Objectives	1	2	3	4	5	BS-IT Program Objectives
1. Be successful in applying for entry level professional positions in computing-related fields, or for admission to graduate programs.	X					1. To provide our graduates with a broad-based education that will form the basis for personal growth and life-long learning.
2.1 A high-quality technical education in computing,		X				2. To provide our graduates with a quality technical education that will equip them for productive careers in the field of Information Technology.
2.2 Communication and team-work skills,			X			3. To provide our graduates with the communication skills and social and ethical awareness requisite for the effective and responsible practice of their professions.
2.3 Awareness of the ethical and social responsibilities of their profession,				X		4. To maintain a diverse student population and actively promote an environment in which students from all groups, including the traditionally under-represented, may successfully pursue the study of Information Technology.
2.4 An ability to engage in continued professional development activities.				X		5. To maintain a qualified and dedicated faculty who actively pursue excellence in teaching.

D. Alumni Survey of Program Educational Objectives

IMPORTANT NOTE: KFSCIS has performed this survey biennially in Summer-Fall 2019 as well as Summer-Fall 2021. It was done without distinguishing the specific Undergraduate Programs (CS, IT, and CY). As all these programs merge in a variety of ways in the industrial setting, it is impossible to partition our alumni experience for a specific program.

Alumni responding to the survey are asked to rate the contribution of their broad educational experience at FIU to their personal growth, capacity for life-long learning, communication skills, social and ethical awareness, career preparation, and preparation for graduate study. They rate their preparation in the major areas of the BS-CS/IT/CY curriculum. The respondents also provide "overall" ratings of their FIU educational experience and the student's preparation at graduation. Finally, the alumni provide a rating of their overall satisfaction with the BS in IT program.

Responses to the survey questions are on the following scale

4: Excellent, 3: Good, 2: Satisfactory, 1: Poor, and 0: Unsatisfactory

The table below summarizes the responses to this survey. The means for the current survey cycle, May 2021 to Nov 2021, are compared with corresponding means for earlier cycle, May 2019 to November 2019. The alumni survey questions for both CS and IT programs were based on the CS program objectives. **We will revise these questions to include IT and CY program objectives and the student's degree (CS/IT/CY)**. The raw data for the current cycle and the statistical results for the current assessment period are presented in Appendix E-1. Although 116 alumni responded, every evaluative query was not answered by at least 40 of them. Hence, we are reporting results for all practical purposes for 76 respondents.

	May 2021 to Nov. 2021		May 2019 to Nov. 2019	
Alumni Survey of Program Objectives	116 Respondents		122 Respondents	
Program Educational Objective	*Outcome Average*	*Attainment Percentage*	*Outcome Average*	*Attainment Percentage*
Capacity for personal growth	3.36	83.90	3.39	84.72
Capacity for life-long learning	3.48	86.99	3.39	84.72
Development of communication skills	3.15	78.77	3.11	77.78
Awareness of social, ethical responsibility	3.03	75.71	3.06	76.39
Preparation for career in CS	3.05	76.37	3.11	77.78
Preparation for graduate study	3.13	78.13	2.92	72.92
Overall preparation upon graduation	3.01	75.19	3.06	76.56
Computer Programming	3.10	77.61	3.36	84.03
Systems Development	2.8	70.08	2.78	69.44

Data Structures & Algorithms	3.21	80.22	3.25	81.25
Computer Architecture & Organization	2.91	72.76	2.86	71.53
Overall FIU educational experience	3.20	80.01	3.16	79.05
Overall satisfaction with BS-CS program	3.11	77.66	3.12	78.05

Table 4: Alumni Survey of Attainment of Program Educational Objectives

E. Employer Survey of Program Educational Objectives

This is the fourth biennial Assessment for which we have surveyed the Employers of our students and the members of the Industrial Advisory Board of the School (many employ our graduates). The survey instrument is included in Appendix E-2. The raw data and statistical results are included in Appendix E-3, and the results are included in the table below. Note that the participation for this survey last time (May through November 2019) was pretty low (9 responses; only 5 completed). It is substantially improved this time around (May through November 2021) (50 responses; 28 completed). The employer survey questions were based on the CS program objectives. **We will revise these questions to include IT and CY program objectives and the employee's degree (CS/IT/CY)**.

Employer Survey of Program Objectives	(28) Respondents	
	Outcome Attainment	
Program Educational Objective	*Average*	*Percentage*
Ability to learn new Emerging Concepts	3.48	87.00
Mastery of CS concepts & ability to solve problems	3.19	79.81
Ability to communicate verbally	3.32	83.04
Ability to communicate in written form	3.24	81.00
Understanding of social, ethical concerns	3.09	77.27
Ability to work cooperatively in a team	3.36	83.93
(Will you consider hiring our graduates – 28-YES, 0-NO) (an important gauge of preparation for career in CS)	4.00	100.00
OVERALL ATTAINMENT OF PROGRAM OBJECTIVES	3.29	82.14

Table 5: Employer Survey of Attainment of Program Educational Objectives

A comparison of results of the current and the last assessment shows that the Overall Attainment of Program Objectives is reduced from 3.66 to 3.29. But one should not place too much credence to this as last time, only 5 responses were recorded. So far as "Hiring of Our Graduates" is concerned, 100% of 28 respondents indicated that they would do so in the future, too.

Some comments from the Employers who chose to make them are included below:

- The technical acumen of the graduates is very good, but there is a lack of customer service skills and soft skills.

- Our previous interns/FTE from FIU have performed very well.

- Wonderful graduates. Would emphasize interpersonal and communications skills... technical foundation is excellent.

- I believe FIU has an excellent computer science program. I have hired 3 CompSci FIU undergraduates in the last 2 years. As a group, they have experience in mainstream programming languages (Java and Python). This is not the case at other South Florida programs. For example, FAU [insert -> Florida Atlantic University] graduates that don't take certain elective courses only have experience with C/C++. I have not found one FIU intern candidate taking the computer science software and design track. I highly suggest the software testing course to prepare candidates for modern software development. I also suggest entry level AWS certification to learn cloud (IAAS, i.e. networking) computing concepts.

- I'm always pleased to see the quality and quantity of INNOVATION displayed by the students at every single Capstone/Senior Project exhibit at the end of the semester. Thank you!!

- I would like to see demonstrations of developing algorithms to solve specific problems, or completion of a course emphasizing this.

- The FIU students have been very successful as developers in our WF Technology program. They are very mobile as well in opting to relocate for the position. We have been more than happy with our FIU hires.

- Graduates do well in our recruitment process, showing skills, such as highly knowledgeable, engaged, and enthusiastic. Those who accept offers advance in the company or can leverage opportunities for other exciting career prospects.

- It has been a pleasure working with FIU in recruiting future talent for this company. The firm is excited to begin in person recruiting again in the upcoming semesters.

F. Course Embedded Direct Assessment

SCIS began applying course-embedded assessment of the BS in IT program in Fall 2021. This strategy was applied using multiple-choice (M-C) quizzes or observing student assignments and/or projects. Most of the student ratings are based on their performance in M-C quizzes, and a few observations are derived from their assignment and/or project work. This direct assessment data will be presented in the following assessment cycle report.

IV. EVALUATION

In this section of the report, the data presented in the previous section are evaluated. For quantitative data, the threshold value at which KFSCIS deems a measured item to satisfy its criteria is 75% of the maximum attainable rating.

Measured Item	Scale	Threshold
Course Outcomes	1 to 5	3.75
Student Outcomes	0 to 5	3.75
Program Objectives	0 to 4	3.00

A. Course Outcomes

The Subject Area Coordinator (SAC) reports (Appendix C) present the data obtained for each course via surveys by students and instructors. The Course Outcomes for each required or elective course of the BS in Information Technology program are evaluated for relevance and attainment by the SAC. Their evaluations are contained in the SAC reports.

The evaluation of the Course Outcomes by the Assessment Coordinator (AC) is based on the student ratings of the course outcomes summarized in Table 1.

AC-Evaluation-01: The data for Course Outcomes by Student Surveys for courses not taught (CNT 4603) during the period of evaluation and the MAD 1100 course are not available. Note that KFSCIS began offering its own Discrete Mathematics course (COT 3100) in Spring 2017 to replace MAD 1100. The course outcomes data for this course are quite impressive (Value of Outcomes = 4.77/5, Coverage Adequacy = 4.04/5).

AC-Evaluation-02: The Value of Course Outcomes rating of every course for which data are available, exceeds the 3.75 acceptability threshold. In fact, students ascribe at least **high** value (4.00 or higher) to the outcomes of every course except CGS 4854, with the rating of the Value of Course Outcomes of over 86% of courses (20 out of 25) to be **very high** (4.33 or higher). The overall rating for the Value of Course Outcomes is 4.54.

AC-Evaluation-03: The student rating of the Adequacy of Coverage of Course Outcomes for every course except three (CGS 3767 - 3.46, CGS 4854 – 3.63, and COP 4655 – 3.68) exceeds the acceptability threshold of 3.75. In fact, students ascribe at least **high** value (4.00 or higher) to the adequacy of coverage of all except seven courses (CGS 3767, CGS 4285, CGS 4854, COP

3804, COP 4655, COP 4814, and CTS 4348), with the rating of **very high** (4.34 or higher) for 12 out of 25 courses (48%). The overall rating for the Adequacy of Coverage of Course Outcomes is 4.24.

AC-Evaluation-04: Note that overall student participation is quite low in this assessment cycle. This may be due to the disruption of our offerings during the pandemic. Also, KFSCIS discontinued the practice of taking the netbook computers in classes to force the students to complete the surveys. However, we do ask faculty members to announce in class the importance of students doing these assessments. We should explore student incentives (priority in advising, student workshop registrations, etc.) to entice more students to complete these surveys.

B. Student Outcomes

Evaluation of the level of attainment of the BS in IT Student Outcomes utilizes data obtained via several direct and indirect assessment mechanisms listed below:

Indirect Mechanisms:

- The Graduating Student (Exit) Survey,
- Course Outcomes Surveys by Students and by Instructors.

Direct Mechanisms:

No Course-Embedded Assessment was included since the accreditation plan for this degree program was not planned during this assessment cycle (2019-2021).

a) Demonstrate practical hands-on expertise in selection, installation, customizing and maintenance of the state-of-the-art computing infrastructure.

Indicators

1.	Graduating Student Ratings	Relevance 86.64%	Attainment 72.78%	Sample: 36
2.	Course Outcomes CGS 3767	Value: 82.8%	Coverage: 69.2%	Sample: 30
3.	Course Outcomes CGS 4285	Value: 88.8%	Coverage: 78.0%	Sample: 18
4.	Course Outcomes CIS 4431	Value: 87.4%	Coverage: 87.2%	Sample: 19
5.	Course Outcomes CNT 4504	Value: 96.6%	Coverage: 97.2%	Sample: 7
6.	Course Outcomes CTS 4743	Value: 98.2%	Coverage: 97.6%	Sample: 17

Outcome Evaluation: Graduating students consider this Student Outcome highly relevant, and more than 72% believe that they have attained it. Indicator 2 shows that the students do not attain the desired acceptable level of proficiency for CGS 3767. Indicators 3 through 6 substantially

exceed the acceptable threshold for the Value and the Coverage of Course Outcomes for CGS 4285, CIS 4431, CNT 4504, and CTS 4743. Attainment of Student Outcome (a) is rated as **almost acceptable.**

b) Demonstrate practical proficiency in selection, installation, customizing and maintenance of the state-of-the-art software systems.

Indicators

1.	Graduating Student Ratings	Relevance 83.88%	Attainment 78.32%	Sample: 36
2.	Course Outcomes CDA 3102	Value: 87.4%	Coverage: 87.2%	Sample: 47
3.	Course Outcomes CEN 3721	Value: 86.6%	Coverage: 82.2%	Sample: 26
4.	Course Outcomes CGS 3767	Value: 82.8%	Coverage: 69.2%	Sample: 30
5.	Course Outcomes CGS 4285	Value: 88.8%	Coverage: 78.0%	Sample: 18
6.	Course Outcomes CGS 4854	Value: 76.4%	Coverage: 72.6%	Sample: 16
7.	Course Outcomes CIS 4365	Value: 95.0%	Coverage: 86.8%	Sample: 10
8.	Course Outcomes CIS 4431	Value: 87.4%	Coverage: 87.2%	Sample: 19
9.	Course Outcomes CNT 4182	Value: 99.2%	Coverage: 97.0%	Sample: 12
10.	Course Outcomes CNT 4403	Value: 90.4%	Coverage: 90.0%	Sample: 11
11.	Course Outcomes CNT 4504	Value: 96.6%	Coverage: 97.2%	Sample: 7
12.	Course Outcomes CNT 4513	Value: 91.6%	Coverage: 90.6%	Sample: 48
13.	Course Outcomes CNT 4603	Value: N/A	Coverage: N/A	Sample: N/A
14.	Course Outcomes COP 2210	Value: 95.0%	Coverage: 91.8%	Sample: 59
15.	Course Outcomes COP 2250	Value: 86.8%	Coverage: 81.2%	Sample: 18
16.	Course Outcomes COP 3337	Value: 86.6%	Coverage: 77.8%	Sample: 76
17.	Course Outcomes COP 3530	Value: 91.0%	Coverage: 86.0%	Sample: 52
18.	Course Outcomes COP 3804	Value: 90.2%	Coverage: 76.8%	Sample: 19

19. Course Outcomes COP 4005	Value: 91.0%	Coverage: 91.0%	Sample: 10
20. Course Outcomes COP 4338	Value: 83.6%	Coverage: 70.8%	Sample: 56
21. Course Outcomes COP 4655	Value: 80.8%	Coverage: 73.6%	Sample: 5
22. Course Outcomes COP 4703	Value: 87.0%	Coverage: 84.0%	Sample: 22
23. Course Outcomes COP 4751	Value: 87.2%	Coverage: 88.6%	Sample: 7
24. Course Outcomes COP 4813	Value: 86.0%	Coverage: 81.6%	Sample: 10
25. Course Outcomes COP 4814	Value: 89.0%	Coverage: 76.6%	Sample: 20
26. Course Outcomes COT 3100	Value: 85.4%	Coverage: 80.8%	Sample: 92
27. Course Outcomes CTS 4348	Value: 89.4%	Coverage: 78.6%	Sample: 7
28. Course Outcomes CTS 4408	Value: 88.4%	Coverage: 89.6%	Sample: 12
29. Course Outcomes CTS 4743	Value: 98.2%	Coverage: 97.6%	Sample: 17

CNT 4603 Windows System Administration was not offered during this assessment cycle, and no data is available for this course.

Evaluation: Graduating students consider this Student Outcome highly relevant, and more than 78% believe that they have attained it. Indicators 2 through 23 comfortably (rating of **High)** meet the acceptable threshold for the Value and the Coverage of Course Outcomes for all relevant courses (sole exceptions – Coverage in CGS 3767 and COP 4655). Two new courses are introduced in this Assessment period; COP 4751 and CTS 4408. Attainment of Student Outcome (b) is rated as **very good.**

c) Demonstrate general understanding of at least one field where Information Technology plays a central role.

Indicators

1.	Graduating Student Ratings	Relevance 91.66%	Attainment 96.12%	Sample: 36
2.	Course Outcomes CEN 3721	Value: 86.6%	Coverage: 82.2%	Sample: 26
3.	Course Outcomes CGS 4854	Value: 76.4%	Coverage: 72.6%	Sample: 16
4.	Course Outcomes CIS 4365	Value: 95.0%	Coverage: 86.8%	Sample: 10

5. Course Outcomes CIS 4431	Value: 87.4%	Coverage: 87.2%	Sample: 19
6. Course Outcomes CNT 4182	Value: 99.2%	Coverage: 97.0%	Sample: 12
7. Course Outcomes CNT 4403	Value: 90.4%	Coverage: 90.0%	Sample: 11
8. Course Outcomes CNT 4504	Value: 96.6%	Coverage: 97.2%	Sample: 7
9. Course Outcomes CNT 4513	Value: 91.6%	Coverage: 90.6%	Sample: 48
10. Course Outcomes CNT 4603	Value: N/A	Coverage: N/A	Sample: N/A
11. Course Outcomes COP 3337	Value: 86.6%	Coverage: 77.8%	Sample: 76
12. Course Outcomes COP 3530	Value: 91.0%	Coverage: 86.0%	Sample: 52
13. Course Outcomes COP 3804	Value: 90.2%	Coverage: 76.8%	Sample: 19
14. Course Outcomes COP 4005	Value: 91.0%	Coverage: 91.0%	Sample: 10
15. Course Outcomes COP 4338	Value: 83.6%	Coverage: 70.8%	Sample: 56
16. Course Outcomes COP 4655	Value: 80.8%	Coverage: 73.6%	Sample: 5
17. Course Outcomes COP 4703	Value: 87.0%	Coverage: 84.0%	Sample: 22
18. Course Outcomes COP 4751	Value: 87.2%	Coverage: 88.6%	Sample: 7
19. Course Outcomes COP 4813	Value: 86.0%	Coverage: 81.6%	Sample: 10
20. Course Outcomes COP 4814	Value: 89.0%	Coverage: 76.6%	Sample: 20
21. Course Outcomes COT 3100	Value: 85.4%	Coverage: 80.8%	Sample: 92
22. Course Outcomes CTS 4348	Value: 89.4%	Coverage: 78.6%	Sample: 7
23. Course Outcomes CTS 4408	Value: 88.4%	Coverage: 89.6%	Sample: 12
24. Course Outcomes CTS 4743	Value: 98.2%	Coverage: 97.6%	Sample: 17

CNT 4603 Windows System Administration was not offered during this assessment cycle, and no data is available for this course.

Evaluation: Except for the coverage of outcomes in CGS 4854 (72.6%) and COP 4655 (73.6%) courses, all indicators suggest that attainment of Student Outcome c) is **very good**.

d) Demonstrate understanding of the social and ethical concerns of the practice of Information Technology.

Indicators

1.	Graduating Student Ratings	Relevance 93.34%	Attainment 89.99%	Sample: 36
2.	Course Outcomes CEN 3721	Value: 86.6%	Coverage: 82.2%	Sample: 26
3.	Course Outcomes CGS 3095	Value: 95.0%	Coverage: 93.2%	Sample: 623
4.	Course Outcomes CIS 4365	Value: 95.0%	Coverage: 86.8%	Sample: 10
5.	Course Outcomes CNT 4182	Value: 99.2%	Coverage: 97.0%	Sample: 12

Among the three common courses for CS, IT, CY programs, no assessment data is available for CGS 1920 (not feasible to conduct the assessment for the 1-credit lower-division orientation course) and ENC 3249 (taught by the Department of English). The assessment data for the third common course CGS 3095, represents the combined value for all three programs. We will include student majors in the assessment data for the next assessment cycle to obtain data for each degree program.

Evaluation: All indicators suggest that attainment of Student Outcome d) is **excellent**.

e) Demonstrate the ability to work cooperatively in teams.

Indicators

1.	Graduating Student Ratings	Relevance 90.54%	Attainment 95.55%	Sample: 36
2.	Course Outcomes CGS 3095	Value: 95.0%	Coverage: 93.2%	Sample: 623
3.	Course Outcomes CIS 4431	Value: 87.4%	Coverage: 87.2%	Sample: 19
4.	Course Outcomes CNT 4504	Value: 96.6%	Coverage: 97.2%	Sample: 7

Evaluation: Graduating students rate this outcome as highly relevant and feel that they have attained it (Indicator 1). Current students find this outcome to be Highly Valuable and believe that it is exceptionally well-covered in the classroom (Indicator 4). Evaluation of student projects in CGS 3095 (Indicator 2) shows that students demonstrate **a pretty good** understanding of social and ethical issues in computing. Overall, attainment of Student Outcome e) is rated as **very good**.

f) Demonstrate effective communication skills.

Indicators

1.	Graduating Student Ratings	Relevance 89.44%	Attainment 85.54%	Sample: 36
2.	Course Outcomes CGS 3095	Value: 95.0%	Coverage: 93.2%	Sample: 623
3.	Course Outcomes CNT 4504	Value: 96.6%	Coverage: 97.2%	Sample: 7

Evaluation: All indicators suggest that attainment of Student Outcome f) is **excellent**.

g) Demonstrate familiarity with fundamental ideas and issues in the arts, humanities and social sciences.

Indicators

1.	Graduating Student Ratings	Relevance N/A	Attainment N/A	Sample: 36
2.	Course Outcomes CEN 3721	Value: 86.6%	Coverage: 82.2%	Sample: 26
3.	Course Outcomes CGS 3095	Value: 95.0%	Coverage: 93.2%	Sample: 623
4.	Course Outcomes CIS 4365	Value: 95.0%	Coverage: 86.8%	Sample: 10

Evaluation: The rating for the outcome "g" was not assessed in the graduate student exit survey since students take interdisciplinary courses (9 credits) from diverse disciplines in the university (Indicator 1). Current students of CGS 3095 find this outcome to be Highly Valuable and believe that it is Very-well covered (Indicator 3). Both value and coverage ratings for CEN 3721 and CIS 4365 are very high. Attainment of Student Outcome g) is rated as **very good.**

C. Program Educational Objectives

The principal means of assessing attainment of the Program Educational Objectives of the BS in Information Technology program are the Alumni and Employer Surveys of Program Objectives.

The alumni responses are summarized in Table 4 (Section III.D), showing the averages of the 116 responses in the period from May 2021 to November 2021. The alumni responses provide ratings of the specific facets of each objective and overall ratings of some objectives. The Alumni Survey raw data are included in Appendix E-1.

The employer survey (Appendix E-2) responses are summarized in Table 5 (Section III.E), showing the averages of the 5 responses from May 2021 to November 2021. These responses provide ratings of specific facets of each objective and the overall rating of their combination. The relevant data is included in Appendix E-3.

Attainment of Student Outcomes enables the attainment of the Program Educational Objectives, and so some Student Outcome data are again noted in this section where relevant. The other constituent groups within the KFSCIS umbrella; WICS, ACM, STARS, UPE, GDSC (Google Development Student Club – new), Programming Team, and Industrial Advisory Board (IAB), provide indicators of the attainment of the program objectives. The activity reports of the student organizations are included in Appendix G, and the minutes of the IAB meetings during the assessment period are included in Appendix H. Since the beginning of 2015, we have held two Board meetings per year.

1. Be successful in applying for entry level professional positions in computing-related fields, or for admission to graduate programs.

Indicators

- Alumni Survey of Program Educational Objectives:
  Please rate how your educational experience at FIU contributed to your preparation for a career in computer science
  May 2021 to November 2021: **76.37%** Previous cycle: **77.78%**
  Please rate how your educational experience at FIU contributed to your preparation for graduate study
  May 2021 to November 2021: **78.13%** Previous cycle: **72.92%**

- Employer Survey of Program Educational Objectives:
  Please rate the following skill of our graduates: Will you consider employing our graduates in the future
  May 2021 to November 2021: **100%** Previous Cycle: **100.00%**

  This is at best a very indirect metric to gauge the overall attainment of this Program Objective from the employers' viewpoint.

- Student Chapter activities (Appendix G): Students are given plenty of opportunity to participate in a variety of activities that improve their association with the computing communities and learn the field outside the classroom. Some examples are given below.

  ACM Chapter: Through their five programs; ACM Build, ACM Learn, ACM Grow, ACM Reach, & ACM Scale; this Student Chapter provides students the opportunity to gain experience at various software and hardware workshops (GitHub, GitLab, Robotics, and Android), participate in the professional development sessions, have access to industry professionals, give back to the community, and create a semester-long project in a team-based environment taught by mentors who have gone on to do internships at Google, Facebook, PlayStation, and more!

  WICS: Organized many Workshops and Learning Sessions on the following topics: Thriving in CS Panels, landing a job in Tech, Overcoming Imposter Syndrome, Finding Your Voice, Finding Your Career Path, Not underestimating one's potential, and so on. The club also provided members and other students the opportunity to attend Industry Professional Sessions with Program Managers and Software Engineers from Microsoft, SnapChat, Visa, Adobe, Bank of America, Disney, All State, ServiceNow, Deloitte, Geico, and JP Morgan Chase. WICS hosted an internship information session with Kaseya.

  Upsilon Pi Epsilon: As the only honor society in the field of Computing, UPE's mission is to provide our students with a community that recognizes their academic achievements and promotes career development. The organization accomplishes this mission by offering various programs and activities through which students can gain knowledge, develop their skills, and kick-start their professional careers. UPE taught students software and hardware development skills through various Workshops (Game Dev, Coding Cupid, Python, 3D printing, and so on). It also organized many events, including Google Cloud Platform, Hacking and Cyber Security, SparkDev Game Night, SparkDev Demo Day, Machine Learning with Google, etc. Many events were organized to prepare students for a career in the Tech Industry. Some examples include MITRE Super Day, Advance Interview Preparation, Advance Resume Reviews, Advance Certifications, etc. It also involved students in hackathons through its organization of events like ShellHacks, Global Game Jam, and Hack Night. Finally, it conducted the Google ignite CS Program to allow students to promote computer science education and reach out to the community.

  STARS: Provided High-Quality peer-to-peer tutoring services for an average of 20 courses per term. Chat groups that use the WhatsApp application to provide this fully online service. On average, 90 to 150 students per semester register for access to one or more course support chat groups.

  Programming Team activities: Programming Team members received weekly tutorials, training sessions, weekly mock competitions, travel to attend coaching camps and retreats, and master classes by visiting expert coaches; Team members were recommended and received internship opportunities at Ultimate Software, Google, Apple, Uber, and more, where many have become full-time employees; Members were provided scholarships in

2020-2021 to the tune of $11,250. In 2017, FIU was a site for the ACM Regional Programming Competition. The Academy organizes the competition for CS Education with FIU undergraduate and graduate student volunteers. The competition brings about 20-30 teams from across S. Florida to FIU's campus from southeastern states. The competition was successfully held in Fall 2019. The Academy hosts the Annual FIU High School Programming Competition in the Spring semester, attended by about 40 teams from Florida high schools, the largest competition of its kind in South Florida. The High School Programming Competitions and the Robotics Competitions were canceled for 2019-20 and 2020-21 due to the pandemic.

Google Developers Student Club: Google Developer Student Clubs (GDSC), otherwise known as Developer Student Clubs @ Florida International University (DSC @ FIU), was founded in Fall 2020 to help students meet people with similar interests, learn about a wide range of technology, and apply their new learnings and connections to support the local community. DSC @ FIU is part of Google Developer's GDSC initiative, creating university-based community groups powered by Google for students interested in Google Developer technology. The club has organized various events, including Cloud Hero Workshop, ShellHacks Intro to Python Workshop, and Game Night. In Spring 2021, some members participated in the 2021 Google Solution Challenge. Workshops held included Resume Roast, Computer Vision with Deep Learning, GitHub, and Testing your Application. Other activities included ShellHacks TensorFlow Workshop, Tech Internship Panel, and Intro to Python Series.

Evaluation: Employers truly like the training provided to our students and overwhelmingly indicate that they will continue to hire them. Our alumni observe that they are well equipped for their professional careers after graduation. And our student chapters are doing exceedingly well in holding workshops on a variety of topics of interest to their members and providing them an opportunity to learn about new topics and participating in newer academic activities. Attainment of Program Educational Objective 1 is deemed **acceptable** with a rating of **very good**.

2.1 Be prepared for career accomplishment, responsibility and advancement in computing-related professions by virtue of having received in the BS program, a high-quality technical education in computing.

Indicators

- Alumni Survey of Program Educational Objectives:
  Please rate the quality of your preparation upon graduation in Computer Programming
  May 2021 to November 2021: **77.61%** Previous cycle: **84.03%**
  Please rate the quality of your preparation upon graduation in Systems Development
  May 2021 to November 2021: **70.08%** Previous cycle: **69.44%**
  Please rate the quality of your preparation upon graduation in Data Structures & Algorithms
  May 2021 to November 2021: **80.22%** Previous cycle: **81.25%**
  Please rate the quality of your preparation upon graduation in Computer Architecture & Organization
  May 2021 to November 2021: **72.76%** Previous cycle: **71.53%**

Calculated Overall rating of Technical Preparation upon Graduation
May 2021 to November 2021: **75.19%** Previous cycle: **76.56%**

- Employer Survey of Program Educational Objectives:
  Please rate the following skill of our graduates: Mastery of the fundamental computer science concepts and ability to solve computing problems using them
  May 2021 to November 2021: **79.81%** Previous Cycle: **85.00%**

- Enabling Student Outcomes – Graduating Student Survey:
  a) A - Ability to apply knowledge of computing and mathematics: **85.45%**
  b) B - Ability to analyze problem - identify and define its computing requirements: **84.92%**
  c) C - Ability to design, implement, and evaluate a computer-based system: **83.69%**
  d) I - Ability to use current techniques, skills, and tools necessary for computing practice: **79.08%**
  e) J - Ability to apply mathematical foundations and algorithmic principles in design of computer systems: **82.77%**
  f) K - Ability to apply design and development principles to construct complex software systems: **83.08%**

Evaluation: This Program Educational Objective is paramount. The percentage ratings shown above for the current Alumni survey cycle are almost the same as those reported in the 2017 assessment report:

Alumni Survey Period	**5/21 to 11/21**	**5/19 to 10/19**
# Responses	**116**	**122**
Computer Programming	77.61	84.03
Systems Development	70.08	69.44
Data Structures & Algorithms	80.22	81.25
Architecture & Organization	72.76	71.53

The ratings for preparation in the Systems Development and Computer Organization & Architecture areas have been consistently below acceptable. In contrast, the ratings for Data Structures & Algorithms and Computer programming have consistently been high. Note that ratings are just about the same as those received in the last assessment cycle (exception – Computer Programming). *It is interesting to note that when they graduate, the students feel that they have attained proficiency in essentially all CS areas at a very high rating. Still, it diminishes considerably when they have worked in the industry.*

Attainment of Program Educational Objective 2.1 is deemed **acceptable** with a rating of **very good**.

2.2 Be prepared for career accomplishment, responsibility and advancement in computing-related professions by virtue of having received in the BS program, communication and team-work skills.

Indicators

- Alumni Survey of Program Educational Objectives:
  Please rate how your educational experience at FIU contributed to the development of your communication skills
  May 2021 to November 2021: **78.77%** Previous cycle: **77.78%**

- Employer Survey of Program Educational Objectives:
  Please rate the following skill of our graduates: Ability to communicate verbally
  May 2021 to November 2021: **83.04%** Previous Cycle: **95.00%**
  Please rate the following skill of our graduates: Ability to communicate in written form
  May 2021 to November 2021: **81.00%** Previous Cycle: **95.00%**
  Please rate the following skill of our graduates: Ability to work cooperatively in teams
  May 2021 to November 2021: **83.93%** Previous Cycle: **95.00%**

- Enabling Student Outcomes – Graduating Student Rating:
  a) D - Ability to function effectively on teams to accomplish a common goal: **83.69**
  b) F - Ability to communicate effectively with a range of audiences: **77.85%**

Evaluation: It is interesting to note that the perspective on this outcome/objective is quite similar from students' graduation to employment. While the enabling outcomes are rated to be excellent by employers, the alumni assign the only acceptable rating. This circumstance underscores the need to have continuing communication and dialog with our alumni.

Attainment of Program Educational Objective 2.2 is deemed **acceptable** with a rating of **very good.**

2.3 Be prepared for career accomplishment, responsibility and advancement in computing-related professions by virtue of having received in the BS program, awareness of the ethical and social responsibilities of their profession.

Indicators

- Alumni Survey of Program Educational Objectives:
  Please rate how your educational experience at FIU contributed to the development of your awareness of social and ethical responsibility
  May 2021 to November 2021: **75.71%** Previous cycle: **76.39%**

- Employer Survey of Program Educational Objectives:
  Please rate the following skill of our graduates: Understanding of Social and Ethical Concerns
  May 2021 to November 2021: **77.27%** Previous Cycle: **87.50%**

- Enabling Student Outcomes – Graduating Student Rating:
  a) E - Understanding of professional, ethical, legal, security, and social issues: **78.46%**
  b) G - Ability to analyze local and global impact of computing on society: **75.76%**

Evaluation: It is interesting to note that the perspective on this outcome/objective is quite similar from students' graduation to employment. The enabling outcomes are rated high by graduating students, alumni, as well as employers.

Attainment of Program Educational Objective 2.3 is deemed **acceptable** with a rating of **good.**

2.4 Be prepared for career accomplishment, responsibility and advancement in computing-related professions by virtue of having received in the BS program, an ability to engage in continued professional development activities.

Indicators

- Alumni Survey of Program Educational Objectives:

Please rate how your educational experience at FIU contributed to your capacity for personal growth

May 2021 to November 2021: **83.90%** Previous cycle: **84.72%**

Please rate how your educational experience at FIU contributed to your capacity for lifelong learning

May 2021 to November 2021: **86.99%** Previous cycle: **84.72%**

- Employer Survey of Program Educational Objectives:

Please rate the following skill of our graduates: Ability to learn new and Emerging Concepts and Technologies

May 2021 to November 2021: **87.00%** Previous Cycle: **90.00%**

- ACM Chapter activities (Appendix G)
  - ❖ Organization of student-led, faculty-led, and industry-led Workshops
  - ❖ helping students secure internships, improve their resume writing skills, teaching them how to use Git version control in order to learn how to interview with companies
  - ❖ Build Activity: Introduction to Python
  - ❖ Organizing Social Events
  - ❖ Provide access to Industry Professionals
  - ❖ Organize Professional Development Sessions
  - ❖ Teach "Giving back to the Community" and provide opportunities to do the same

- UPE Activities (Appendix G)
  - ❖ Organization of technical Workshops
  - ❖ Organizing Information Sessions (Software, Hardware, and Game Development Programs)
  - ❖ Conducted other Activities (Google Ignite CS, Gaming Tournament, ShellHacks, Global Game Jam, Hack Night, and others)

- ❖ Google igniteCS Program allows students to promote computer science education and reach out to the community. Through the program, students currently visit many elementary and middle schools in Miami-Dade County every week, teaching hundreds of students, Computer Science and Information Technology.
- ❖ Prepare students for a career in Tech Industry through various events
- ❖ Organizing a Town Hall Meeting between students, School administrators, and faculty

- WICS Activities (Appendix G)
  - ❖ Participating in Grace Hopper Celebration every year
  - ❖ Organizing Workshops and Learning Sessions to assist Women in CS to gain more confidence in themselves.
  - ❖ Hosting 1:1 Industry Professional Sessions with Program Managers and Software Engineers from Microsoft, SnapChat, Visa, Adobe, Bank of America, Disney, AllState, ServiceNow, Deloitte, Geico and JP Morgan Chase.
  - ❖ Hosting Internship Information Sessions.

- STARS Activities (Appendix G)
  - ❖ Providing high-quality Peer Tutoring Services for many courses (an average of 20 courses per term) with a primary focus on Java programming, Data Structures, Databases, and Networking. On average, 90 to 150 students register for access to one or more course support chat groups. Their retention rate is excellent.
  - ❖ Scheduling Midterm and Final Exam Review Sessions
  - ❖ In Summer 2019, STARS offered fully online tutoring services via WhatsApp chat groups. This in support of our online offerings served a very useful purpose deemed extremely helpful by online students. The practice was continued in subsequent terms, too.

- Programming Team Activities (Appendix G)
  - ❖ The teams have received scholarships, weekly tutorials, training sessions, weekly mock competitions, travel to attend coaching camps and retreats, and master classes by visiting expert coaches
  - ❖ Most programming team member have served an internship at Ultimate Software, Google, Apple, Uber, and more. Many have since become full time employees at their interning companies
  - ❖ Other team members have enrolled in graduate studies
  - ❖ Scholarships for Team Members were provided in 2020-2021 ($11,450). No funds were provided in 2019-2020.
  - ❖ In the summer of 2019, a 5-day training camp for competition problem solving was held on the campus of FIU in partnership with the programming team from UNAL, Bogota, Colombia
  - ❖ Beginning in 2017, FIU has been a site for the **ACM Regional Programming Competition**. The competition is organized by the Academy for CS Education with FIU undergraduate and graduate student volunteers. The competition brings

about 20-30 teams from across S. Florida to FIU's campus from across the southeastern states. The competition was successfully held in Fall 2019. FIU's teams placed 17, 19 and 25th in Division 1. Due to the pandemic, FIU was not a site in 2020-21. It was held virtually and both Divisions were merged into one large division, making the competition much fiercer than ever before. FIU's teams placed 37, 55, 57 and 64th.

- ❖ In Spring of each year, the Academy hosts the Annual **FIU High School Programming Competition**, attended by about 40 teams from Florida high schools, the largest competition of its kind in South Florida.

- Google Developers Student Club (Appendix G)
  - ❖ Help students learn a wide range of technology.
  - ❖ Create University-based community groups powered by Google for students interested in Google Developer Technology.
  - ❖ Participate in Google Developer's Annual Solution Challenge
  - ❖ Participate in various workshops like ShellHacks Intro to Python, Cloud Hero, and Game Night.
  - ❖ Host a Tech Internship Panel for students to attend.

Evaluation: It is not clear that attainment of this objective is directly enabled by specific courses in the Computer Science major. Rather, the collective breadth represented by the entire BS in Computer Science program may have an enabling effect. In addition, the breadth component common to all FIU majors, the Core Curriculum and non-major elective courses, is a principal contributor to any graduated student's realization of personal growth and capacity for lifelong learning.

Alumni feel that their education at FIU contributed significantly to their personal growth and lifelong learning experiences. Employers, too, give this Objective an Excellent rating.

Involvement with the School's student organizations is another excellent enabler of this objective. A variety of experiences are provided to students to learn how to engage in Continued Professional Development. These include Workshops, Technical Events, Competitions, and Preparing for their future in the job market. However, these voluntary experiences are not exploited by many of our graduates, particularly night students.

Attainment of Program Educational Objective 2.4 is deemed **acceptable** with a very good rating.

V. RECOMMENDATIONS

A. Recommendations of the Subject Area Coordinators

Subject Area: Application Development (SAC: Antonio Hernandez)

CEN 3721: No change in the curriculum or outcomes is suggested

COP 4005: In faculty appraisals, it was mentioned that students have limited programming skills. Evaluation at the department level might be necessary to determine whether previous courses develop in students the programming skills required by this course.

COP 4655: In faculty appraisals, it was mentioned that students have poor OO development skills. Evaluation at the department level might be necessary to determine whether previous courses develop in students the programming skills required by this course.

COP 4813: Consider including review lecture/materials on Web site development.

COP 4814: It is essential that all assignments and tests provide students with the list of objectives being evaluated or approached. Students then can effectively assess the completion of the course objectives.

Overall observation: Student participation in the course evaluation system since Summer 2019 is consistently low. In one course for example, only 5 students in total participated in the university survey in four semesters. Discussing in class about the importance of this tool in curriculum assessment can go a long way in incrementing these numbers.

Subject Area: Computer Organization (SAC: Dong Chen)

CDA 3102: Continue the use interactive textbooks (Zybooks) and in the new course CDA-3102 since ZyBooks was helpful in improving student learning.

Overall observation: Student participation in the course evaluation system since Summer 2019 is consistently low. This may be due to the migration of the evaluation process to fully online mode after Spring 2018 and Covid-19 pandemic. Perhaps students who complete course evaluation before the final exam week, may be given preference in advising, student workshop registrations, extra credits, etc. Also, the Covid-19 pandemic has some impact on students' course preparation and faculty's course delivery format. Continuing to provide interactive textbooks or Zoom videos might reduce the impacts and help improve student learning.

Subject Area: Database (SAC: Antonio L Bajuelos)

COP 4703: One instructor consistently indicated that other prerequisite outcomes that might help students to be better prepared for this class: Basic understanding of Client/Server model.

COP 4722: Some students expressed a concern about sharing the work in group projects and the credit for each team member. In the past, one instructor consistently indicated that the objective "Object-Oriented Database" and "Spatial and Multimedia Databases" as inappropriate. It is recommended that two outcomes of this course need to be discussed and possibly readjusted.

COP 4751: No change is suggested on the course outcomes or syllabus.

CTS 4408: One instructor indicated that it would be helpful if students were familiar with SQL and database principles, and COP - 4703 would be very relevant (Prerequisite Outcome Suggestion/Recommendation)

Overall observation: Student participation in the course evaluation system is consistently low. This may be due to the migration of the evaluation process to fully online mode after Spring 2018. Perhaps students who complete course evaluation before the final exam week may be given preference in advising, student workshop registrations, etc.

Subject Area: Foundations (SAC: Hadi Amini)

COT 3100: No change is needed on the course outcomes or syllabus.
As some instructors raised the concern for deficient skills in MAC-1105, COP-2210, and/or COP-2250 during the first week of the semester; Instructors are encouraged to evaluate the students' understanding of the prerequisite materials during the first week of semester and provide additional resources to student who have lack of required knowledge.

Overall observation: Given the high registration for this course, student participation in the course evaluation system since 2019 is consistently low. Perhaps students who complete course evaluation before the final exam week, may be given preference or receive incentives to encourage them for participating in evaluation.

Subject Area: Network (SAC: Deng Pan)

CGS 3767: Update the textbook with the state-of-the-art OSs. Add coverage for the use of text editors, basic command line functions, and shell programming. Add more hands-on projects.

CGS 4285: Add more hands-on practice. The course outcomes should be reviewed and updated. Avoid scheduling the course for a mini semester with six weeks.

CNT 4513: Add more hands-on projects, especially Wireshark labs. The course outcomes should be reviewed and updated. Some outcomes, such as the ATM protocols are outdated and should be removed.

CNT 4504: There is no significant concern expressed by the students or faculty.

Overall observation: In general, students request more hands-on practice opportunities. The learning outcomes of some courses should be reviewed and updated.

Subject Area: Professional Development (SAC: Richard Whitaker)

CGS 1920: No changes are recommended in the curriculum or course outcomes. However, the faculty members who have taught the course feel that the Course Title should be changed to "Introduction to the Field of Computing."

CGS 3095: No changes are recommended. The students did indicate that the textbook was not very helpful.

ENC 3249: No changes are recommended. However, technical writing should be emphasized more in this course as instructors found the students' writing skills in CGS 3095 "deficient to adequate."

Subject Area: Programming (SACs: Maria Charters and Janki Bhimani)

CGS 4854 (Maria Charters): Evaluate and select a more modern textbook to aid in providing more current topics. Consider an interactive textbook such as zyBooks that may enable improved student learning. Also, consider creating 2 courses out of this one, where one course is dedicated to an overview of full-stack development, specializing in front-end development tools, and the other course is dedicated to back-end development.

COP 2250 (Maria Charters): Provide students with additional lab time where students can have more hands-on practice and support from the instructor and peer learning assistants.

COP 3804 (MariaCharters): A specific textbook should be used by all instructors of COP-3804, with preference given to an interactive textbook such as zyBooks that provides students with more hands-on practice. Also, additional lab time should be provided to students so they can have more hands-on practice with support from the instructor and peer learning assistants.

Overall observation (Maria Charters): Student participation in the course evaluation system since Summer 2018 has been consistently low. This low participation may be due to the migration of the evaluation process to a fully online mode after Spring 2018. Perhaps students who complete course evaluation before the final exam week may be given a reward such as a few extra credit points in the class, preference in advising, student workshop registrations, etc.

COP 2210 (Janki Bhimani): Continue the use interactive textbooks (Zybooks) and ZyLabs along with the lecture handouts since they were helpful in improving student learning.

COP 3337 (Janki Bhimani): No change is needed on the course outcomes or syllabus.

COP 3530 (Janki Bhimani): No change is needed on the course outcomes or syllabus.

COP 4338 (Janki Bhimani): No change is needed on the course outcomes or syllabus.

Subject Area: Security (SAC: Amin Kharraz)

CIS 4365: Continue to use topics such as cloud security and threat modeling in a different context in the enterprise setting (e.g., software, cloud environment, physical security). I would also add data breaches (i.e., case studies, root causes) and password management at the enterprise level.

CNT 4182: It is not clear how successful the group projects are as the number of participants in the survey is small. If the number of students in the class is low, some solo projects would be good. Also, it would be good to expose students to the notion of malicious code, evasion, and malware (e.g., Mirai botnet) in IoT and Mobile ecosystem.

CNT 4403: The course is offered by multiple instructors. No change is suggested on the course syllabus. Encourage the instructors to follow the syllabus and make sure they deliver the materials promised to students. As we invest more in hybrid modality, encourage the instructors to use all the available resources and assist students.

Subject Area: Systems (SAC: Kianoush Gholamiboroujeni)

CIS 4431: No significant concern is expressed in the Students Suggestions section.

CTS 4348: It would be great if students get exposure to Linux and hands-on experience either before this class or the syllabus of this course includes some introduction to Linux file system, bash terminal, etc., in the first few weeks of this class.

CTS 4743: No change is needed on the course outcomes or syllabus.

CNT 4603: This course was not offered during this assessment cycle.

Overall observation: Student participation in the course evaluation system since Summer 2019, especially in 2020, is very low. Perhaps students who complete course evaluation before the final exam week may be given incentives like preference in advising, student workshop registrations, etc.

B. Recommendations of the Assessments Coordinator

1. Course Related:

AC-01: In 2017, we created a new course (COT 3100) equivalent to Discrete Mathematics (MAD-1100) taught by the Dept. of Mathematics. Now, most, if not all of our students, take COT 3100. Students seem to be deficient in the prerequisite knowledge, and hence, it is recommended that instructors gauge it well at the beginning of the term and take some corrective action.

AC-02: No courses in the Subject Area "Application Development" require any Course Outcomes and Syllabus changes. However, the preparation of students in COP 4005, COP 4655 and COP 4813 was deficient and needed to be addressed by the Undergraduate Program instructors and the undergraduate committee.

AC-03: No courses in the Subject Area "Database" require any course outcomes and syllabus changes. To improve the student prerequisite knowledge for all courses in this subject area, the faculty who teach these courses are recommended to review the prerequisite skills and provide selected online resources at the beginning of the term.

AC-04: No changes to the syllabus and course outcomes are required for the "Network" subject area courses. However, it is recommended that the learning outcomes of these courses need to be examined by the faculty who teach them and include hands-on projects.

AC-05: In the subject area of "Professional development," changing the course title of CGS 1920 needs to be evaluated by the undergraduate committee.

AC-06: No syllabus changes are required for all courses in the "Programming" subject area (COP 2250, COP 3804, CGS 4854). Nevertheless, a common textbook for all sections of each programming course (using the same programming language) is recommended.

AC-07: For the "Security" Subject Area, it is recommended to review the topics for CIS 4365 course in consultation with the faculty who teach that course and revise the syllabus. No changes are required for CNT 4182 and CNT 4403 syllabus.

AC-08: In the Subject Area "Systems," it is recommended to review the basics of Linux system and increase hands-on exercises for the system administration in CTS 4348 course.

AC-9: Sometimes, faculty members are unaware of the recently approved changes to course syllabi and tend to follow the past syllabi. The Associate Director (or designee) needs to ensure that all approved curriculum changes are incorporated timely on the school portal and inform faculty and adjuncts at the beginning of the term to follow the current syllabus from the portal.

2. Procedure Related:

AC-10: In this assessment cycle, student participation in the Course Evaluation System was quite poor. This low participation is mainly due to discontinuing our practice of taking netbook computers to every class and making students fill in these surveys. If that is not doable now for difficulties in its implementation, then we must find other mechanisms to improve this participation. Maybe we should look into giving students some incentive to complete these surveys. Several SACs were quite critical of students' level of participation in our CES.

AC-11: For very few courses, the Instructor Course Appraisals are not completed. The Associate Director (or designee) should ascertain that these are filled by the instructors every term.

AC-12: As suggested in the last Assessment Report regarding the inadequate participation of Employers in the survey, meaningful steps were taken to improve this participation. We increased it from 9 responses (5 answered questions) to 50 (28 responded to questions). This is a substantial improvement, and it is suggested to keep following the current strategy in the future to increase the rate of participation of Employers further.

3. General:

AC-13: The quality, the variety, and the number of activities performed by our student clubs (teaching new subjects through workshops, providing opportunities to improve through technical activities, providing outreach to communities by helping students in middle and high schools, and so on) have increased a lot as compared with their past activities. A new Student Club (Google Developers Student Club) has begun which is providing an appropriate training to students to become better employable. STARS has undertaken major responsibility to assist students in their education by providing more and better support for their learning. KFSCIS administrators should continue to support them in whatever way possible, including providing more space for their activities.

AC-14: For a few years now, the meetings of the Industrial Advisory Board have been conducted at the end of the Fall and Spring semesters when selected students present their Capstone Projects. Members have been suitably impressed with their work in the past and continue to be impressed now. Many members act as mentors and/or judges for these projects. This has proven to be very beneficial for the students. We should continue to find more and better ways to engage the Board members in student activities.

VI. CONCLUSION

The BS in Information Technology program continues to deliver high-quality preparation for entry into the computing workforce or admission to graduate programs in computing. The delivery of its required coursework (Coverage Adequacy) continues to receive very high ratings from students, as expressed in the Surveys of Course Outcomes (4.24/5, 84.8%, Table 1). Evaluations of attainment of its Student Outcomes (4.32/5, 86.4%, Table 3) and Program Educational Objectives (3.20/4, 80.0%, Table 4) meet or exceed the minimum acceptability criteria.

MAD 1100 (Discrete Mathematics taught by Math Faculty) is now fully substituted by COT 3100 (Discrete Structures taught by CS Faculty) in this assessment cycle. Students indicated Value of Outcomes (4.34, 86.8%) and Coverage Adequacy (4.04, 80.8%) exceed our acceptable criteria.

Our course offerings have diversified (continued process) with the computing field's emphasis on new applications. Accordingly, in this Assessment cycle, we have added many new courses as Electives in a variety of Subject Areas, most importantly, "Application Development" and " System Administration." We have also introduced other Undergraduate Degree Programs, including BA-CS and BS-CY, and are feverishly working to introduce BS in Data Science. Continuing Bachelor's Programs include BS-CS and BA-IT.

The student chapters have increased their activities in quality, quantity, and variety. For example, the FIU-ACM student chapter created a semester-long project for students to complete in a team-based environment taught by mentors who have gone on to do internships at Google, Facebook, PlayStation, and more!

Since 2017, FIU has been a site for the **ACM Regional Programming Competition**. The Academy organizes the competition for CS Education with FIU undergraduate and graduate student volunteers. The competition brings about 20-30 teams from across S. Florida to FIU's campus from southeastern states. The competition was successfully held in Fall 2019. FIU's teams placed 17, 19 and 25th in Division 1. Due to the pandemic, FIU was not a site in 2020-21. It was held virtually, and both Divisions were merged into one large division, making the competition much fiercer than ever before. FIU's teams placed 37, 55, 57, and 64th.

STARS has provided peer tutoring to all students covering multiple CS and IT courses. On average, 90 to 150 students per semester register for access to one or more course support chat groups. Typically, 25 different courses are covered every semester. This level of involvement of students for student success overseen by a faculty member of the School is already paying dividends in improving our graduation rates.

UPE has remained home to the largest and most active group of students in the School. To this end, in the 2019-2021 academic years, UPE had an active membership of over 700+ students and inducted over 140 new members to the national UPE society. In addition, the FIU UPE chapter hosted the UPE National Convention in March 2020 and April 2021 and won the UPE Outstanding National Chapter Award in 2020 and the Continuing Excellence national Chapter

Award in 2021. UPE members continue to win the FIU Worlds Ahead Award, with three members winning in 2019 and one in 2020.

WIECS (Women in Engineering and Computer Science) has become very active, and the School supports many members to attend the annual Grace Murray Hopper Conference. Its membership keeps growing, which is very heartening to the School.

The KFSCIS Industrial Advisory Board is increasingly involved in all facets of our operation, as indicated by the minutes of its meetings included in Appendix H. The Board meetings are usually held at the end of the fall and spring semesters. However, due to the pandemic, the Board meeting scheduled for the end of spring 2020 was moved to September 2020.

In all meetings, selected presentations of the Senior Projects are made to the Board by student teams, and members have praised the student work profusely. (There were no Capstone Projects demonstrations in the September 2020 meeting.) One Board member is very heavily involved in the evaluation of every project. The overall involvement of the Board has been instrumental in improving the nature of projects handled by the students.

Board members have made many suggestions to improve our work with students and faculty. Some of these suggestions include:

- Increasing our concentration of AI and ML in teaching and research,
- Submitting a higher number of patent applications,
- Understanding the needs of local employers to improve the probability of our students acquiring good-paying jobs locally,
- Assisting in identifying executives of local companies that hire our graduates and seeking their suggestions,
- Develop partnerships to obtain large scale grants,
- Assisting the School and College teams to increase philanthropic donations to the School, and
- Assist the School in hiring new faculty members at all levels. This is further necessitated after receiving the Knight Foundation donation of $10M, which calls to hire 20 new faculty members in the next ten years.

In the last few years, particularly in this assessment period, we have substantially increased student participation in internships and employer participation in job fairs on campus. With a full-time staff member looking after these activities, the student success has been nothing short of phenomenal.

The biennial assessment works out exceedingly well and gives us more meaningful information from one report to the next. The participation of the entire faculty is profound and meaningful, and we observe reasonable modifications in our curriculum based on the recommendations made in this report.

The ABET Review of the BS in CS Program was conducted in Fall 2016, and we passed it with flying colors. We are preparing for the upcoming ABET Review in Fall 2022. We will apply for

the accreditation of three programs this time; BS in CS, BS in IT, and BS in Cybersecurity. Looking at the results of these biennial assessments and using the recommendations of various constituencies (Students, Faculty, Advisory Board members, and Employers) to improve our curriculum, student learning, student placement, and introduction of new Degree Programs, we sincerely believe that we are well-placed to succeed in the next ABET Reviews as well.