ISSN: 1545-679X

Information Systems Education Journal

Volume 8, Number 67 http://isedj.org/8/67/ August 6, 2010

In this issue:

IS 2002 and ABET Accreditation: Meeting the ABET Program Outcome Criteria

Jeffrey P. Landry
University of South Alabama
Mobile, AL 36688 USA

Roy J. Daigle
University of South Alabama
Mobile, AL 36688 USA

Herbert E. Longenecker, Jr.
University of South Alabama
Mobile, AL 36688 USA

J. Harold Pardue
University of South Alabama
Mobile, AL 36688 USA

Abstract: This paper builds upon prior work that described the relevance of the IS 2002 model curriculum for ABET accreditation. The authors previously grouped the IS 2002 learning units by the ABET core curriculum areas for information systems. The most recent ABET guidelines emphasize assessment of program learning outcomes and alignment of these outcomes with the information systems community. This paper demonstrates how the IS 2002 model curriculum can be used for the new ABET requirements.

Keywords: assessment, IS 2002 model curriculum, ABET, accreditation, mapping

---

Recommended Citation: Landry, Daigle, Longenecker, and Pardue (2010). IS 2002 and ABET Accreditation: Meeting the ABET Program Outcome Criteria. *Information Systems Education Journal, 8* (67). http://isedj.org/8/67/. ISSN: 1545-679X. (A preliminary version appears in *The Proceedings of ISECON 2009:* §1534. ISSN: 1542-7382.)

This issue is on the Internet at **http://isedj.org/8/67/**

The **Information Systems Education Journal** (ISEDJ) is a peer-reviewed academic journal published by the Education Special Interest Group (EDSIG) of the Association of Information Technology Professionals (AITP, Chicago, Illinois). • ISSN: 1545-679X. • First issue: 8 Sep 2003. • Title: Information Systems Education Journal. Variants: IS Education Journal; ISEDJ. • Physical format: online. • Publishing frequency: irregular; as each article is approved, it is published immediately and constitutes a complete separate issue of the current volume. • Single issue price: free. • Subscription address: subscribe@isedj.org. • Subscription price: free. • Electronic access: http://isedj.org/ • Contact person: Don Colton (editor@isedj.org)

This paper was in the 2009 cohort from which the top 45% were accepted for journal publication. Acceptance is competitive based on at least three double-blind peer reviews plus additional single-blind reviews by the review board and editors to assess final manuscript quality including the importance of what was said and the clarity of presentation.

IS 2002 and ABET Accreditation: Meeting the ABET Program Outcome Criteria

Jeffrey P. Landry
jlandry@usouthal.edu

Roy J. Daigle
RDaigle@usouthal.edu

Herbert E. Longenecker, Jr.
longeneckerb@gmail.com

Harold Pardue
hpardue@usouthal.edu

School of CIS, FCW-20
University of South Alabama
Mobile, Alabama 36688 USA

Abstract

This paper builds upon prior work that described the relevance of the IS 2002 model curriculum for ABET accreditation. The authors previously grouped the IS 2002 learning units by the ABET core curriculum areas for information systems. The most recent ABET guidelines emphasize assessment of program learning outcomes and alignment of these outcomes with the information systems community. This paper demonstrates how the IS 2002 model curriculum can be used for the new ABET requirements.

Keywords: assessment, IS 2002 model curriculum, ABET, accreditation, mapping

1. INTRODUCTION

Previously, the IS 2002 information systems model curriculum guidelines (Gorgone, et al, 2002) were shown to be useful for accreditation through the relationship of IS 2002 learning units (LUs) to the ABET areas of information systems curriculum content (Landry, et al 2004, 2005). The ABET accreditation requirement was that IS programs report on curriculum coverage of the following topic areas:

- Hardware and Software
- Modern Programming Language
- Data Management
- Networking and Data Communications
- Systems Analysis and Design
- IS in Organizations

IS programs seeking accreditation are to report on semester-hour coverage, both core and advanced, in each of the six content areas, and also list specific courses that embody a significant amount of content in each area.

The IS 2002 model curriculum was demonstrated to be a useful means for describing the content areas. IS 2002 learning units (LUs) were mapped to the content areas, providing a detailed description of each area in terms of a set of specific learning goals. When faculty link their local courses to the model curriculum using a mapping process (Daigle, et al, 2004), an indirect mapping to the ABET areas is also achieved (because

courses are mapped to IS 2002 LUs which are mapped to the ABET areas). And because the IS 2002 LUs are the basis for a national exit assessment exam, it was possible to report assessment results in terms of these ABET content areas (Landry, et al, 2004).

While reporting on the ABET content areas remains an accreditation requirement, ABET has added an outcomes-based approach to its accreditation process. In 2007, ABET began requiring that IS programs identify learning objectives and outcomes at the program level. The objectives are the expected accomplishments during the first few years after graduation, and the outcomes are what a student is expected to be able to do at the time of graduation. The objectives and outcomes were to be achievable by graduates and exiting seniors, respectively, and be periodically assessed using data collection and analysis techniques. The outcomes assessment process must include an evaluation step as well, one that would close the loop and lead to program improvements (ABET, 2007; Rogers, 2009).

We believe that the outcome-based approach required by ABET is consistent with the educational philosophy of the IS 2002 model curriculum. This paper will demonstrate how IS 2002 is useful for outcomes assessment. The remainder of this paper discusses the ABET program outcomes and two related outcomes criteria associated with the outcomes. The link between IS 2002 and ABET outcomes is then described, and an example is used to illustrate the mapping of a course to the ABET outcomes and IS 2002 LUs.

2. ABET PROGRAM OUTCOMES

The revised ABET accreditation criteria (ABET CAC, 2007) includes a requirement regarding program outcomes, that is, educational outcomes to be achieved by exiting seniors by the time of graduation. These criteria are referred to commonly as "a through i," apply to computer science, information systems, and information technology programs, and are enumerated in Section 3 of the ABET self-study questionnaire, entitled "Program Outcomes."

Criterion

The program has documented measurable outcomes that are based on the needs of the program's constituencies.

The program enables students to achieve, by the time of graduation:

> *(a) An ability to apply knowledge of computing and mathematics appropriate to the discipline;*
>
> *(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;*
>
> *(c) An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs;*
>
> *(d) An ability to function effectively on teams to accomplish a common goal;*
>
> *(e) An understanding of professional, ethical, legal, security, and social issues and responsibilities;*
>
> *(f) An ability to communicate effectively with a range of audiences;*
>
> *(g) An ability to analyze the local and global impact of computing on individuals, organizations and society;*
>
> *(h) Recognition of the need for, and an ability to engage in, continuing professional development;*
>
> *(i) An ability to use current techniques, skills, and tools necessary for computing practices.* (ABET, 2007, p. 14)

We considered and interpreted these criteria for our specific information systems program, and wrote one-word identifiers that were easy to remember and captured the essence of each outcome (in order from a to i): BASICS, ANALYZE, BUILD, TEAMING, ETHICS, COMMUNICATION, IMPACT, LEARNING, and TOOLS.

An additional outcomes-based ABET requirement is that "the program outcomes are consistent with those accepted by the information systems community" (ABET, 2007, p. 14). We believe that IS 2002 is useful for addressing both the "a-i" set of outcomes criteria as well as the criterion of IS community acceptance.

3. IS 2002 MODEL CURRICULUM

The IS 2002 model curriculum is a set of curriculum guidelines for four-year undergraduate degree programs. One of the key goals of the model curriculum is to produce graduates with industry-desired skill sets (Landry, et al, 2000). At the most detailed level is what we feel is the heart of the model curriculum—its 150 learning units, developed by a consortium of faculty and industry collaborators. The LUs encompass educational content, including a learning goal and an indicator of the depth of coverage recommended.

The depth of coverage used is a modified Bloom scale. When mapping local courses to learning units, a faculty member uses the depth metric as follows. For each local course, identify the IS 2002 LUs that are covered by the local course, and for each local course objective-LU pair, assign a number between 1 and 4, where:

1 = Recognition of element

2 = Differentiate among knowledge elements

3 = Use knowledge, with hints, direction and assistance

4 = Apply knowledge to new problems without assistance

4. OUTCOMES-BASED LINKAGE BETWEEN ABET AND IS 2002

The linkage between the ABET outcomes criteria (a through i) and IS 2002 LUs is referred heretofore as the "ABET-LU" mapping. Although the authors are content matter experts in curriculum and information systems thinking, and have previously published an ABET-LU mapping, multiple variations of an ABET-LU mapping are possible. The mappings presented here are the authors' interpretations of how the ABET outcomes criteria and IS 2002 LUs fit together to describe program outcomes at the authors' local institution. For the simplicity of classification, each LU was mapped into one-and-only-one ABET outcomes criterion. Faculty at other institutions could follow a similar process to interpret their locally-defined program outcomes in terms of ABET outcomes criteria and IS 2002.

Table 1 in the appendix illustrates a summary of one possible (the authors') ABET-LU mapping. The table contains, for each ABET outcome, the letter and ABET criterion statement, the author's one-word label, the authors' interpretation of the outcome's meaning, and a listing of the mapped LUs.

This mapping reflects the view that, in addition to the fundamentals (BASICS), the IS 2002 model curriculum emphasizes analysis (ANALYZE), and design (BUILD), and organizational context (IMPACT), based on the frequency of mapped LUs in each ABET outcome area.

Taking a look at a specific outcome criterion, ETHICS, seven learning units have been mapped to that content area. See Table 2 in the appendix, which also contains the LU goal.

An analysis of the chosen ethical LUs indicates that IS ethics, according to IS 2002, concerns professional ethics and a professional code of conduct; responsibilities among the professional roles of management, users, and designers; individual principled behavior with respect to time management and communication; and the concept of alignment.

5. EXAMPLE: CREATING A COURSE-TO-PROGRAM OUTCOMES MAP FOR A LOCAL COURSE

Given the creation of a complete ABET-LU map that accounts for linking each of the 150 LUs into one of the nine ABET learning outcomes, local courses can be mapped. The process we are describing is to take a local course, one taught in an IS program, and follow a three-step process. The process described would accomplish an ABET task, that of supplying a course-to-program outcomes map required of an ABET self-study (ABET, 2007, p. 7). In our case, we adopted the ABET outcomes criteria a through i as our program's learning outcomes. We decided to do this, and then interpret the ABET outcomes for the meaning they have for our program. Therefore, for our school, creating the course-to-program outcomes map is an activity consistent with the separate "a through i" compliance check.

ABET recommends a tabular format linking course outcomes to program outcomes with each cell indicating which course outcomes

relate to which program outcomes, and the strength of that relationship. The means of specifying the "strength" of a relationship is not specified; we have chosen the modified Bloom depth metric from IS 2002. The course-to-program outcomes mapping process for a course is as follows:

1-Identify an ABET outcome that maps to the local course

2-Identify LU(s) with the ABET-LU map for that ABET outcome

3-Write a local course objective

Note. "Local objective" is an IS 2002 term. Local objectives may or may not be course syllabus objectives. Local course objectives may be written to indicate the local coverage and interpretation of the mapped LU. The ABET equivalent of local objectives is "course outcome." ABET requires a mapping between your (local) courses and student outcomes. Since ABET Outcomes must be enabled, if your student outcomes are different than those provided by ABET, then you may show they are enabled by mapping your student outcomes to those of ABET. Thus the composition is a mapping from your (local) courses to ABET student outcomes.

The following is an example of the three-step process to create a course-to-program outcomes map. The course chosen in this example, entitled "database for information systems", is likely to be common to many curricula and contains a combination of object oriented programming, advanced database concepts and techniques, and software development principles and practices. The course is sometimes referred to as an "implementation" course because it emphasizes later life cycle activities, rather early activities such as requirements analysis. A course description is as follows: *The course builds on relational database and programming concepts by exploring the analysis, design, and implementation of more complex database systems. Topics include advanced data modeling, advanced query design, and application development in a database programming environment.* Typical prerequisites are an object-oriented programming sequence, a course in database management, and maturity (junior or senior year).

An assessment leader and course instructor looked at a list of course syllabus objectives and each of the nine ABET program outcome criteria. They identified four primary linkages, and together, they wrote four local objectives, and identified the depth-level for each. See Table 3 in the appendix.

The local objective on good design and coding practices shown in Table 3 was chosen to map in the ABET ETHICS outcome criterion. We might choose to select one of the seven learning units most closely matching the local objective. That might be LUs 10 or 12 (see Table 2), depending on the intent of the local objective, as either a personal integrity or trustworthiness issue for an individual professional, or else as an adherence to practices that are in the public good. It is possible to link a course outcome to multiple program outcomes. Doing so would result in an additional indicator in each cell along a row. For this course, we developed course outcomes so that they would map cleanly into a single ABET area.

6. CONCLUSION

The use of IS 2002 has been show to assist in ABET accreditation in the following ways:

- demonstrating depth and breadth of coverage in curriculum content areas (Landry, et al 2004, 2005)
- demonstrating compliance with ABET outcomes criteria
- demonstrating alignment of outcomes with the IS community
- creating course-to-program outcomes maps

Additional work linking IS 2002 is possible, especially utilizing the ABET-LU linkages for performance assessment using online certification exams whose questions map to LUs.

7. REFERENCES

ABET Computing Accreditation Commission - ABET CAC (2007) Self-Study Questionnaire. ABET, Inc. August 2007. Baltimore, Maryland.

Daigle, Roy J., Herbert E. Longenecker, Jr., Jeffrey P. Landry, and J. Harold Pardue (2004) "Using the IS 2002 Model Curriculum for Mapping an IS Curriculum." Infor-

mation Systems Education Journal. January 27, 2004. Volume 2 Issue Number 1. URL: http://isedj.org/2/1/

Gorgone, John. T., Gordon B. Davis, J. S. Valacich, H. Topi, D. L. Feinstein, and H. E. Longenecker Jr. (2002) "IS 2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems." ACM. New York, NY. AIS and AITP (formerly DPMA). Park Ridge, IL.

Landry, Jeffrey P., J. Harold Pardue, John H. Reynolds, and Herbert E. Longenecker, Jr. (2005) "Breadth and Depth of Coverage in IS Areas for Curriculum Accreditation: A National Study." Americas Conference on Information Systems (AMCIS 2005). August 2005. Omaha, Nebraska.

Landry, Jeffrey P., J. Harold Pardue, John H. Reynolds, and Herbert E. Longenecker, Jr. (2004) "IS 2002 and Accreditation: Describing the IS Core Areas in Terms of the Model Curriculum." Information Systems Education Conference (ISECON 2004). November 2004. Newport, RI.

Landry, Jeffrey P., J. Harold Pardue, Roy J. Daigle, and Herbert E. Longenecker, Jr. (2004) Using IS2002 to Assess the Impact of a Proposed Curriculum Change." Americas Conference on Information Systems (AMCIS 2004). August 2004. New York, NY.

Landry, Jeffrey P., Herbert E. Longenecker, Jr., Brandon Haigood, and David L. Feinstein (2000) "Comparing Entry-Level Skill Depths across Information Systems Job Types: Perceptions of IS Faculty." Americas Conference on Information Systems (AMCIS 2000). August 2000. Long Beach, California.

Rogers, Gloria (2009) "The Language of Assessment: Humpty Dumpty Had a Great Fall…Assessment Tips with Gloria Rogers." Communications Link. http://abet.org/Linked%20Documents-UP-DATE/Assessment/Assessment%20Tips3.pdf. Accessed on March 30, 2009.

APPENDIX – TABLES 1-3

TABLE 1. ABET-LU MAPPING

ABET Crit	*(a)*	*An ability to apply knowledge of computing and mathematics appropriate to the discipline*
Interpret	*BASICS*	*Computing--basic fundamentals in CIS-ISC at level 1 and 2 of Bloom; algebra and statistics; applying math to specific problems, such as computing project completion times in a project management course*
Course.LU	**Lvl**	**Learning unit title**
0.13.01	1	Work and activity concepts
0.13.02	1	Support: individuals vs groups
0.13.03	1	Info analysis: individual vs group
0.13.05	2	Organizing personal data resources
0.13.06	2	Database terminology and concepts
0.13.07	2	Accessing/retrieving/storing data
0.13.08	2	Is life cycle: developing with packages
0.13.11	2	Implementing simple algorithms
0.13.15	2	IS Technology Evolution
1-5	1	Systems and Quality
1.7	1	IT Hardware and Software
3.16	2	IS Theory
3.22	2	Systems and Quality, and IS
3.27	2	IS Types
3.28	2	IS Development Standards
3.30	1	Personal, Performance Evaluation
4.62	3	Telecom, Systems View HW/SW
4.63	2	IT Peripheral Devices
4.64	1	IT Hardware Architectures
4.65	1	IT Systems Software Components, Interactions
4.67	2	OS Functions
4.68	1	OS Environments and Resources
4.69	2	OS, Installation, Configuration for Multi-Media
4.70	2	OS, Interoperability and Systems Integration
4.71	3	OS, Installation, Configuration of Multi-User Systems
5.43	2	Data: Characters, Records, Files, Multi-Media
5.44	2	ADTs, Classes, Objects
5.45	2	Problem Solving, Formal Problems and IS

5.61	2	Programming: Language Comparison
6.32	2	Telecom, Devices, Media, Systems
6.33	2	Telecom, Organizational Support By
6.35	2	Telecom, Standards, Standard Organizations
6.36	2	Telecom, Central/Distributed Systems
6.37	2	Telecom, Architectures, Topologies, Protocols
6.38	2	Telecom, Hardware and Software
6.40	2	Telecom, Installation, Implementation
8.89	2	ADTs: Database Models and Functions
9.116	4	IS Life Cycles and Projects
ABET Crit	*(b)*	*An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution*
Interpret	*ANALYZE*	*Problem solving in context of programming, classical and object-oriented systems analysis and design, networking and telecomm and project management that emphasize early life cycle activities*
Course.LU	**Lvl**	**Learning unit title**
0.3	1	Problem Solving, Small IS
0.13.04	2	Info analysis: finding is/it requirements
0.13.1	2	Procedural/event driven programming
0.14	3	Problem Solving, with Packages
0.15	3	Information Use Strategies
1.13	3	IS Personal Level Systems
3.19	2	Personal, Cognitive Process
3.20	2	Personal, Goals and Decisions
3.21	2	Decision Making, Simon Model
3.24	2	Systems, Work-Flow, Organizational Systems
5.42	3	Information Measurements/Data/Events
5.53	2	ADTs: Data and Files Structures
5.54	3	ADTs: Arrays, Lists, Trees, Records
7.72	3	IS Analysis and Design Tasks
7.74	3	IS Requirements and Specifications
7.77	2	IS Development Risks/Feasibility
7.78	3	IS Continuous Improvement and IS
8.99	2	IS Requirements/Work-Flow Planning
9.101	2	IS Implementation with Objects, Event Driven
10.108	4	IS Development, Project Management Tools

10.110	4	IS Applications, Production Systems
10.111	4	IS Requirements and Database
ABET Crit	*(c)*	*An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs*
Interpret	*BUILD*	*Emphasis on later life cycle activities of design, implementation and testing across domains of programming, SA&D, project management, etc.*
Course.LU	**Lvl**	**Learning unit title**
0.13.13	2	Implementing and event driven applications
0.13.14	2	IS Development with Prototyping
0.13.16	3	Implementing a personal is application
1.6	1	Information and Quality
1.8	3	IT Systems Specification
5.46	2	Object Representation of a System
5.47	3	Problem Solving, Algorithm Development
5.48	3	Problem Solving, Top Down Implementation
5.49	2	Problem Solving, Object Implementation
5.50	2	Problem Solving, Modules/Cohesion/Coupling
5.51	2	Verification and Validation, A Systems View
5.55	3	ADTs: Indexed Files, Keys
5.57	3	Problem Solving, Data and File Applications
5.60	3	Problem Solving, Design, Test, Debug
6.41	2	Telecom, LAN, Installation, Configuration
7.75	3	IS Design and Implementation
7.76	3	IS Rapid Prototyping
7.81	3	IS Database Applications Development
7.82	2	Problem Solving, Complexity Metrics
7.83	2	IS Software Quality Metrics
7.84	3	Systems and Quality Metrics/Assessment
8.88	3	IS Data Modeling
8.90	3	IS Database and IS Implementation
8.91	3	IS Database Application Structuring
8.95	3	IS Database Conceptual/Logical Models
8.96	3	IS Functional Specifications
8.98	3	IS Development and Conversion
9.103	3	IS Development Testing

10.109	2	IS Development, Project Close Down
ABET Crit	*(d)*	*An ability to function effectively on teams to accomplish a common goal*
Interpret	*TEAMING*	*Concepts and theories on groups and teams, both within and outside of CIS; working as professionals in a team to meet, communicate, make decisions, resolve conflicts, and complete CIS projects*
Course.LU	**Lvl**	**Learning unit title**
7.79	3	Interpersonal, Consensus Development
7.80	3	Interpersonal, Group Dynamics
8.86	2	Interpersonal, Synergistic Solutions
8.87	3	Interpersonal, Agreements and Commitment
9.120	3	IS Management and IS Department Organization
ABET Crit	*(e)*	*An understanding of professional, ethical, legal, security, and social issues and responsibilities*
Interpret	*ETHICS*	*Roles and responsibilities for various IS professionals; ethical issues and impacts of information technology; behavioral issues such as trust and leadership both within and outside the IS context; professional codes of ethics*
Course.LU	**Lvl**	**Learning unit title**
1.10	1	Characteristics of an IS Professional
1.12	1	Ethics and the IS Professional
3.23	2	Systems, Role of Management, Users, Designers
7.85	2	IS Professional Code of Ethics
9.112	4	Personal, Proactivity, Principled Action
9.113	4	Interpersonal, Empathetic Listening
9.114	4	Interpersonal, Goals, Mission, Alignment
ABET Crit	*(f)*	*An ability to communicate effectively with a range of audience*
Interpret	*COMMUNICATION*	*Written and oral, team and interpersonal communication; written plans and code documentation; interviewing skills*
Course.LU	**Lvl**	**Learning unit title**
8.94	3	IS Development and Project Management
8.97	2	IS Conversion Planning
8.117	4	Personal, Presentation
9.115	3	IS Responsibility to Sell Designs to Management
10.105	3	IS Development, Project Planning

10.106	4	IS Development, Project Management
10.126	3	Personal, Time and Relationship Management
ABET Crit	*(g)*	*An ability to analyze the local and global impact of computing on individuals, organizations and society*
Interpret	*IMPACT*	*A wide variety of issues and concepts dealing with information technology impacts*
Course.LU	**Lvl**	**Learning unit title**
0.4	1	IT and Society
1.9	2	IT and Attaining Objectives
2.200	2	Evolution of IT use
2.201	2	E-commerce relationship types
2.202	2	Value and Supply chain concepts
2.203	2	Customer issues and solutions
2.204	2	E-commerce functionality
2.205	2	Interorganizational Ethical Issues
2.206	2	Hardware/Software Inter-organizational System
2.207	2	Inter-organizational IS Development Methodologies
2.208	2	Individual Privacy Concerns
3.17	2	IS as a Strategic Component
3.18	2	IS Development and Management
3.25	2	Models, Organizational Relationship to IS
3.26	2	IS Planning
3.29	2	IS Implementation, Outsourcing
3.31	2	IS Society and Ethics
3.119	3	Ethics and Legal Issues
3.123	2	IS Management of IS Function
6.34	2	Telecom, Economics, Design Issues
6.39	2	Telecom, Services, Reliability, Security...
6.124	2	IS Management of Emerging Technologies
8.127	3	Quality and Performance Management
10.121	3	Personal, Leadership and IS
10.122	2	IS Policies and Standards
10.125	2	IS Implementation and Outsourcing
ABET Crit	*(h)*	*Recognition of the need for, and an ability to engage in, continuing professional development*

Interpret	*LEARNING*	*Life-long learning, career paths, on-the-job learning, using help features of tools and technology evaluation*
Course.LU	**Lvl**	**Learning unit title**
1.11	1	IS Careers
9.118	4	Personal, Life-Long Learning
ABET Crit	*(i)*	*An ability to use current techniques, skills, and tools necessary for computing practices*
Interpret	*TOOLS*	*Identifying, acquiring, learning, and applying a variety of computer-based tools*
Course.LU	**Lvl**	**Learning unit title**
0.2	1	Knowledge Work Software
0.13.09	2	Configure and customize a package
0.13.12	2	Implementing a simple database design
5.52	2	Problem Solving, Environments and Tools
5.56	2	Problem Solving, IS Applications, Sub-Structures
5.58	3	Problem Solving, with Files and Database
5.59	3	Problem Solving, File/DB Editors/Reports
7.73	3	IS Commercial Implementations
8.92	3	IS Database Application Implementation
8.93	3	IS Application Development/Code Generation
9.100	3	IS Application with Programming Language
9.104	2	IS Applications, Programming Environment
10.107	4	IS Development, Project Management

TABLE 2. LEARNING UNITS FOR ABET ETHICS

IS 2002 course	LU	Bloom Level	LU-title	LU-Goal
1	10	1	Characteristics of an IS Professional	to explain the concepts of individual decision making, goal setting, trustworthiness and empowerment
1	12	1	Ethics and the IS Professional	to present and discuss the professional and ethical responsibilities of the IS practitioner
3	23	2	Systems, Role of Management, Users, Designers	to discuss a systems based role for management, users and designers
7	85	2	IS Professional Code of Ethics	to explain the use of a professional code of ethics to evaluate specific IS actions
9	112	4	Personal, Proactivity, Principled Action	to develop a functional understanding of proactive principled behavior and time management
9	113	4	Interpersonal, Empathetic Listening	to ensure attitudes necessary to successful team behavior including empathetic listening, consensus negotiation, conflict resolution, and synergistic solution finding, and to apply the concept of commitment and rigorous completion
9	114	4	Interpersonal, Goals, Mission, Alignment	to ensure goal setting and alignment of team activities with project obligations

TABLE 3. EXAMPLE OF A COURSE-TO-PROGRAM OUTCOMES MAP

Course Outcome (write course outcome below, using a learned capability verb)	Basics	Analyze	Build	Teaming	Ethics	Communication	Impact	Learning	Tools
Model transactional (e.g. sales order) data systems based on requirements stories		3							
Develop a row-editor application that adheres to an n-tier architecture, runs on a web server, and that performs read, insert, update, and delete, operations on a database table			3						
Practice good design practices, such as a 3-tiered architecture, and good coding practices, such as meaningful identifier naming, that supports high quality and maintainability of software					2				
Using the DDL and DML of the Structured Query Language and MS SQL-Server, write and test advanced queries, such as stored procedures, triggers, views, and audit logs									3