LEARNING OUTCOMES ASSESSMENT PLAN
DEPARTMENT OF MATHEMATICAL, INFORMATION AND COMPUTER SCIENCES
Updated March 2014

COMPUTER INFORMATION SYSTEMS MAJOR

Department Learning Outcome (Teach): *Graduates will have a coherent and broad-based knowledge of the discipline of Information Systems.*

Means of assessment (annual): Require students to take the ETS Major Field Test in Computer Science as the mid-term exam in IS 481, Senior Seminar in Information Systems.

Criteria of success: 50% of our students achieve above the 25th percentile on the exam.

Program Learning Outcomes (Teach):

1. Students will be able to write correct and robust software.

   Means of Assessment (annual): CSC254 Signature Assignment

   Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

2. Students will analyze the interaction between hardware and software.

   Means of Assessment (every 2 years): CSC314 Signature Assignment

   Criteria for Success: 80% of the students should have an average score of at least 7.

3. Students will use information management as a tool to support decision making in business environments.

   Means of Assessment (every 2 years): ISS414 Signature Assignment

   Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

Department Learning Outcome (Shape): *Students will develop characteristics necessary to be effective members of the communities where they work and live.*

Program Learning Outcomes (Shape):

4. Students will be able to apply their technical knowledge to solve problems.

   Means of Assessment (every 2 years): ISS414 Signature Assignment.

   Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

5. Students will be able to speak about their work with precision, clarity and organization (Oral Communication).

   Means of Assessment (annual): Each student will be required to give a 20-minute oral presentation on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:
   - Command of background material
   - Organization
   - Oral presentation skills (added as part of the new rubric in the spring of 2010)
   - Use of presentation tools
   - Ability to field questions from the audience

   Note that the department has a mapping between its rubric and the AAC&U Oral Communication Value Rubric.

   Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas in the department rubric. This translates to 80% of the students being above a 3.5 in the AAC&U rubric.

6. Students will be able to write about their work with precision, clarity and organization (Written Communication).

   Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:
   - Bibliography and other supporting documentation
   - Organization
   - Grammar and spelling
   - Depth of information
   - Clarity of writing

   Note that the department has a mapping between its rubric and the AAC&U Written Communication Value Rubric.

   Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas in the department rubric. This translates to 80% of the students being above a 3.5 in the AAC&U rubric.

7. Students will collaborate effectively in teams.

   Means of Assessment (annual): CSC324 Signature Assignment (assignment and rubric to be developed).

   Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

8. Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand (Information Literacy).

   Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (capstone) to 1 (benchmark) in the following areas:
   - Determine the Extent of Information Needed
   - Access the Needed Information
   - Evaluate Information and its Sources Critically (carefully explains the reason for the choice of sources).
   - Use Information Effectively to Accomplish a Specific Purpose
   - Access and Use Information Ethically and Legally

   Criteria for Success: 80% of the students should have an average score of at least 3 in each of the major areas.

9. Students will be able to gather relevant information, examine information and form a conclusion based on that information (Critical Thinking).

   Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (capstone) to 1 (benchmark) in the following areas:
   - Explanation of issues
   - Evidence: Selecting and using information to investigate a point of view or conclusion
   - Context (students can explain how their work fits into the larger context of the discipline).
   - Student's position and findings (can clearly explain their findings and the limitations of their work)
   - Conclusions and related outcomes (implications and consequences)

   Criteria for Success: 80% of the students should have an average score of at least 3 in each of the major areas.

10. Students will be able to understand and create arguments supported by quantitative evidence, and they can clearly communicate those arguments in a variety of formats (Quantitative Reasoning).

    Means of Assessment (annual): Each student will be required to complete a quantitative reasoning assignment as part of Senior Seminar. The students will be given the evaluation criteria with their assignment and will rated by the faculty using a rubric with a scale of 4 (capstone) to 1 (benchmark) in the following areas:
    - Interpretation: Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)
    - Representation: Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)
    - Calculation
    - Application / Analysis: Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis
    - Assumptions: Ability to make and evaluate important assumptions in estimation, modeling, and data analysis
    - Communication: Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized)

    Criteria for Success: 80% of the students should have an average score of at least 3 in each of the major areas.

Department Learning Outcome (Send): *We believe that work is an act of service. Graduates will be prepared to serve a complex world through their technical and professional abilities.*

Program Learning Outcomes (Send):

11. Computer Information Systems graduates will be adequately prepared for entry into graduate school or jobs in the computing profession.

    Means of assessment (annual): Require students to take the ETS Major Field Test in Computer Science as the mid-term exam for the capstone course, Computer Science 481, Senior Seminar in Computer Science.

    Criteria of success: 50% of our students achieve above the 25th percentile on the exam.

    Means of assessment (every 5 years): Alumni will be surveyed every five years. They will be asked at least the following questions:
    - If you have a job in Computer Science: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Science curriculum at PLNU prepared you for your work in the field?
    - If you are going to graduate school or went to graduate school: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Science curriculum at PLNU prepared you for graduate school?

    Criteria of success**:** An average response of 2 for each question.

COMPUTER SCIENCE MAJOR

Department Learning Outcome (Teach): *Graduates will have a coherent and broad-based knowledge of the discipline of computing.*

Means of assessment (annual): Require students to take the ETS Major Field Test in Computer Science as the mid-term exam for the capstone course, Computer Science 481, Senior Seminar in Computer Science.

Criteria of success: 50% of our students achieve above the 50th percentile on the exam.

Program Learning Outcomes (Teach):

1. Students will be able to write correct and robust software.

   Means of Assessment (annual): CSC254 Signature Assignment

   Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

2. Students will use the theory of algorithms and computation to solve problems.

   Means of Assessment (annual): ETS Major Field Test in Computer Science: Structures and Algorithms subscore

   Criteria for Success: The department subscore will be at the 65th percentile or higher.

3. Students will analyze the interaction between hardware and software.

   Means of Assessment (annual): ETS Major Field Test in Computer Science: Computer Organization, Architecture and Operating Systems subscore and CSC314 Signature Assignment.

   Criteria for Success:
   ETS: The department subscore will be at the 65th percentile or higher.
   CSC314: 80% of the students should have an average score of at least 7.

Department Learning Outcome (Shape): *Students will develop characteristics necessary to be effective members of the communities where they work and live.*

Program Learning Outcomes (Shape):

4. Students will be able to apply their technical knowledge to solve problems.

   Means of Assessment (every 2 years): CSC493 Signature Assignment (assignment and rubric to be developed)

   Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

5. Students will be able to speak about their work with precision, clarity and organization (Oral Communication).

   Means of Assessment (annual): Each student will be required to give a 20-minute oral presentation on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:
   - Command of background material
   - Organization
   - Oral presentation skills (added as part of the new rubric in the spring of 2010)
   - Use of presentation tools
   - Ability to field questions from the audience

   Note that the department has a mapping between its rubric and the AAC&U Oral Communication Value Rubric.

   Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas in the department rubric. This translates to 80% of the students being above a 3.5 in the AAC&U rubric.

6. Students will be able to write about their work with precision, clarity and organization (Written Communication).

   Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:
   - Bibliography and other supporting documentation
   - Organization
   - Grammar and spelling
   - Depth of information
   - Clarity of writing

   Note that the department has a mapping between its rubric and the AAC&U Written Communication Value Rubric.

   Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas in the department rubric. This translates to 80% of the students being above a 3.5 in the AAC&U rubric.

7. Students will collaborate effectively in teams.

   Means of Assessment (annual): CSC324 Signature Assignment (assignment and rubric to be developed).

   Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

8. Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand (Information Literacy).

   Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (capstone) to 1 (benchmark) in the following areas:
   - Determine the Extent of Information Needed
   - Access the Needed Information
   - Evaluate Information and its Sources Critically (carefully explains the reason for the choice of sources).
   - Use Information Effectively to Accomplish a Specific Purpose
   - Access and Use Information Ethically and Legally

   Criteria for Success: 80% of the students should have an average score of at least 3 in each of the major areas.

9. Students will be able to gather relevant information, examine information and form a conclusion based on that information (Critical Thinking).

   Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (capstone) to 1 (benchmark) in the following areas:
   - Explanation of issues
   - Evidence: Selecting and using information to investigate a point of view or conclusion
   - Context (students can explain how their work fits into the larger context of the discipline).
   - Student's position and findings (can clearly explain their findings and the limitations of their work)
   - Conclusions and related outcomes (implications and consequences)

   Criteria for Success: 80% of the students should have an average score of at least 3 in each of the major areas.

10. Students will be able to understand and create arguments supported by quantitative evidence, and they can clearly communicate those arguments in a variety of formats (Quantitative Reasoning).

    Means of Assessment (annual): Each student will be required to complete a quantitative reasoning assignment as part of Senior Seminar. The students will be given the evaluation criteria with their assignment and will rated by the faculty using a rubric with a scale of 4 (capstone) to 1 (benchmark) in the following areas:
    - Interpretation: Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)
    - Representation: Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)
    - Calculation
    - Application / Analysis: Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis
    - Assumptions: Ability to make and evaluate important assumptions in estimation, modeling, and data analysis
    - Communication: Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized)

    Criteria for Success: 80% of the students should have an average score of at least 3 in each of the major areas.

Department Learning Outcome (Send): *We believe that work is an act of service. Graduates will be prepared to serve a complex world through their technical and professional abilities.*

Program Learning Outcomes (Send):

11. Computer Science graduates will be adequately prepared for entry into graduate school or jobs in the computing profession.

    Means of assessment (annual): Require students to take the ETS Major Field Test in Computer Science as the mid-term exam for the capstone course, Computer Science 481, Senior Seminar in Computer Science.

    Criteria of success: 50% of our students achieve above the 50^{th} percentile on the exam.

    Means of assessment (every 5 years): Alumni will be surveyed every five years. They will be asked at least the following questions:
    - If you have a job in Computer Science or Computer Information Systems: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Information Systems curriculum at PLNU prepared you for your work in the field?
    - If you are going to graduate school or went to graduate school: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Computer Information Systems curriculum at PLNU prepared you for graduate school?

    Criteria of success**:** An average response of 2 for each question.

MATHEMATICS MAJOR

Department Learning Outcome (Teach): *Graduates will have a coherent and broad-based knowledge of the discipline of Mathematics.*

Means of assessment (annual): Require students to take the ETS Major Field Test in Mathematics as the mid-term exam for the capstone course, Mathematics 481, Senior Seminar in Mathematics.

Criteria of success: 50% of our students achieve above the 50th percentile on the exam.

Program Learning Outcomes (Teach):

1. Students will be able to demonstrate facility with analytical concepts.

   Means of Assessment (annual): ETS Major Field Test in Mathematics: Calculus subscore

   Criteria for Success: The department subscore will be at the 65th percentile or higher

2. Students will be able to write proofs.

   Means of Assessment (annual): MTH242 Signature Assignment

   Criteria for Success: 80% of the students to score a 2.5 or higher (on a scale of 1-4) in each of the four areas:
   - Statement of the problem
   - Logic
   - Symbolism
   - Justification

3. Students will be able to demonstrate facility with algebraic structures.

   Means of Assessment (annual): ETS Major Field Test in Mathematics: Algebra subscore

   Criteria for Success: The department subscore will be at the 65th percentile or higher

Department Learning Outcome (Shape): *Students will develop characteristics necessary to be effective members of the communities where they work and live.*

Program Learning Outcomes (Shape):

4. Students will be able to apply their mathematical knowledge to solve problems.

   Means of Assessment (annual): ETS Major Field Test in Mathematics: Applied subscore

   Criteria for Success: The department subscore will be at the 65th percentile or higher

5. Students will be comfortable using technology to solve problems.

   Means of Assessment (annual): MTH382 Signature Assignment and CSC254 Signature Assignment

   Criteria for Success: MTH382: 80% of the students should have an average score of at least 2.5 in each of the major areas.
   CSC254: 80% of the students should have an average score of at least 2.5 in each of the major areas.

6. Students will be able to speak about their work with precision, clarity and organization (Oral Communication).

   Means of Assessment (annual): Each student will be required to give a 20-minute oral presentation on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:
   - Command of background material
   - Organization
   - Oral presentation skills (added as part of the new rubric in the spring of 2010)
   - Use of presentation tools
   - Ability to field questions from the audience

   Note that the department has a mapping between its rubric and the AAC&U Oral Communication Value Rubric.

   Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas in the department rubric. This translates to 80% of the students being above a 3.5 in the AAC&U rubric.

7. Students will be able to write about their work with precision, clarity and organization (Written Communication).

   Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:
   - Bibliography and other supporting documentation
   - Organization
   - Grammar and spelling
   - Depth of information
   - Clarity of writing

   Note that the department has a mapping between its rubric and the AAC&U Written Communication Value Rubric.

   Criteria of Success: 80% of the students should have an average score of at least 2.5 in each of the major areas in the department rubric. This translates to 80% of the students being above a 3.5 in the AAC&U rubric.

8. Students will collaborate effectively in teams.

   Means of Assessment (annual): MTH352 Signature Assignment (assignment and rubric to be developed).

   Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

9. Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand (Information Literacy).

   Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (capstone) to 1 (benchmark) in the following areas:
   - Determine the Extent of Information Needed
   - Access the Needed Information
   - Evaluate Information and its Sources Critically (carefully explains the reason for the choice of sources).
   - Use Information Effectively to Accomplish a Specific Purpose
   - Access and Use Information Ethically and Legally

   Criteria for Success: 80% of the students should have an average score of at least 3 in each of the major areas.

10. Students will be able to gather relevant information, examine information and form a conclusion based on that information (Critical Thinking).

    Means of Assessment (annual): Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (capstone) to 1 (benchmark) in the following areas:
    - Explanation of issues
    - Evidence: Selecting and using information to investigate a point of view or conclusion
    - Context (students can explain how their work fits into the larger context of the discipline).
    - Student's position and findings (can clearly explain their findings and the limitations of their work)
    - Conclusions and related outcomes (implications and consequences)

    Criteria for Success: 80% of the students should have an average score of at least 3 in each of the major areas.

11. Students will be able to understand and create arguments supported by quantitative evidence, and they can clearly communicate those arguments in a variety of formats (Quantitative Reasoning).

    Means of Assessment (annual): Each student will be required to complete a quantitative reasoning assignment as part of Senior Seminar. The students will be given the evaluation criteria with their assignment and will rated by the faculty using a rubric with a scale of 4 (capstone) to 1 (benchmark) in the following areas:
    - Interpretation: Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)
    - Representation: Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)
    - Calculation
    - Application / Analysis: Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis
    - Assumptions: Ability to make and evaluate important assumptions in estimation, modeling, and data analysis
    - Communication: Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized)

    Criteria for Success: 80% of the students should have an average score of at least 3 in each of the major areas.

Department Learning Outcome (Send): *We believe that work is an act of service. Graduates will be prepared to serve a complex world through their technical and professional abilities.*

Program Learning Outcome (Send):

12. Mathematics graduates will be adequately prepared for graduate study, teaching and careers using Mathematics.

    Means of assessment (annual): Require students to take the ETS Major Field Test in Mathematics as the mid-term exam for the capstone course, Mathematics 481, Senior Seminar in Mathematics.

    Criteria of success: 50% of our students achieve above the 50^{th} percentile on the exam.

    Means of assessment (annual): Fieldwork evaluations of prospective teachers in EDU304. The students are rated in several areas of competence using a three point rubric (weak =1, acceptable =2 and strong =3). From these scores an overall rating is computed by taking the mean.

    Criteria of success**:** 80% of the students will have an average score of 2.5 or higher.

    Means of assessment (every 5 years): Alumni will be surveyed every five years. They will be asked at least the following questions:
        1. If you have a job in industry: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Mathematics curriculum at PLNU prepared you for your work in the field?
        2. If you are going to graduate school or went to graduate school: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Mathematics curriculum at PLNU prepared you for graduate school?
        3. If you are in a teaching credential program or working as a teacher: On a scale of 1 to 5, 1 being outstanding and 5 being poor, how well do you think that the undergraduate Mathematics curriculum at PLNU prepared you for teaching?

    Criteria of success**:** An average response of 2 for each question.