INDIANA COMMISSION *for*
HIGHER EDUCATION

Transfer Single Articulation Pathways
(TSAP)

Thursday, May 21, 2015

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<u>**PREAMBLE**</u>

In 2013 the Indiana legislature enacted Senate Enrolled Act 182, thereby establishing the requirements for a Statewide Transfer General Education Core (STGEC) of at least 30 credit hours. The statute states that each educational institution, in collaboration with the Commission for Higher Education, shall, no later than July 1, 2014, work together to create a single articulation pathway (known as the Transfer Single Articulation Pathway or TSAP) for each programmatic area and implement the single articulation pathways no later than May 15, 2015, for students entering state educational institutions in the fall of 2015 (IC 21-42-3-2 and IC 21-42-3-5). The areas for development must be in those which significant numbers of students first achieve an associate of science or an associate of arts degree with the intent of obtaining a related baccalaureate degree.

A Statewide Leadership Team was created to develop a framework for the single articulation pathways and to provide oversight of the implementation process. Fields were identified in which to develop the following single articulation pathways:

1. Business Administration (including Accounting)
2. Computer Science
3. Criminal Justice
4. Education – Early Childhood
5. Education – Elementary
6. Education – Secondary
7. Education – Special
8. Electrical Engineering Technology
9. Information Technology and Informatics
10. Mechanical Engineering
11. Mechanical Engineering Technology
12. Nursing
13. Social Work

Faculty Panels were established to identify competencies and learning outcomes for both associate and baccalaureate degrees. Each pathway contains competencies and learning outcomes that may be derived from specific programmatic accreditation agencies as is noted on each pathway's Executive Summary.

Business Administration Faculty Panel Roster

*Denotes co-chairs for this panel.

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Pathway: Business Administration

Preamble: See document on page 2.

Competencies and Learning Outcomes:

1. Analytical Reasoning/Calculus – Utilize quantitative tools and analysis to solve business problems and make business decisions.

   1.1   Solve modeling problems from several applied areas using linear, exponential, and logarithmic functions.

   1.2   Solve problems which have the following features of limits and derivatives: continuity, the tangent line and its relation to the graph of a function

   1.3   Calculate and interpret average, relative, and instantaneous rates of change of one quantity with respect to another, using the language of differential calculus.

   1.4   Utilize the following formulas and techniques pertaining to derivatives: Differentiation rules for power functions; exponential and logarithm functions; the sum, difference and constant multiplier rules and polynomials; the product, quotient and reciprocal rules and rational functions; the Chain Rule and its special cases.

   1.5   Use derivatives for graphing applications.

   1.6   Discuss the sign of the derivative and its significance to the graph, local extrema, sign of the second derivative as well as its significance, inflection points, and other applications.

   1.7   Model optimization problems from several business areas. Create independent and dependent variables to solve optimization problems. Calculate and interpret the definite integral.

   1.8   Use and apply integrals in a manner that reflects the following: the integral as an anti-derivative; the integral as an area under a curve and the Fundamental Theorem; and integration by the Substitution Technique.

2. Analytical Reasoning/Statistics – Utilize quantitative tools and analysis to solve business problems and make business decisions.

   2.1   Solve business problems using descriptive and inferential statistics.

   2.2   Calculate and interpret measures of central tendency (mode, median, mean) and dispersion.

   2.3   Compute values of a random variable, probability density function, expected value, and standard deviation of a given set of data.

   2.4   Find the mean and standard deviation of a binomial random variable.

2.5   Perform a Z-score conversion using tables of areas under the Standard Normal Curve to determine the probability a randomly selected score is below, between, or above certain values.

2.6   Calculate and analyze sampling distributions of the mean and standard error of the mean.

2.7   Construct confidence intervals of sample means and sample proportions.

2.8   Determine the probability of single, compound (joint), and conditional events.

2.9   Compute combinations and permutations.

2.10   Calculate and interpret results from linear regression as well as covariance and correlation analysis. Interpret the R^2 statistic and coefficients.

2.11   Perform various types of hypothesis testing (i.e., for large and small sample sizes).

2.12   Identify sampling techniques useful for business applications.

2.13   Create, distinguish among, and interpret tables (e.g. frequency distribution, relative frequency distribution) and graphs (e.g. pie chart, bar chart, dot plot, histogram, scatter diagram, boxplot) for different types of data (qualitative vs. quantitative)

2.14   Calculate probabilities for different types of probability distributions such as the binomial, uniform, discrete, and normal distributions.

3. Business Communication – Communicate effectively in a wide variety of business settings employing multiple media (i.e., written, oral, visual).

3.1   Choose the most appropriate channel for business message delivery (i.e., e-mail, mobile, formal letters, blogs, telephone, face-to-face, social media, etc.).

3.2   Identify when synchronous communication is necessary and effectively research, plan, conduct, and summarize communication.

3.3   Research and format business messages (i.e., persuasive, positive news, request, negative news, etc.) using the appropriate channel.

3.4   Construct well-organized, logical business messages.

3.5   Deliver clear, concise, creative, culturally-sensitive messages that demonstrate command of business vocabulary and language appropriate to the content and intended audience.

3.6   Convert data to information with business recommendations using visuals, reports, and oral presentation.

3.7   Interpret nonverbal communication and exhibit positive nonverbal communications.

3.8   Summarize accurately the business viewpoints of others to demonstrate active listening.

3.9   Use proper grammar/syntax, sentence structure, word choice, tone, punctuation, and style.

4. Business Ethics – Recognize ethical issues in business and utilize thoughtful decision making for sustainable and socially responsible behavior.

    4.1   Describe primary ethical theories and perspective in normative ethics.

    4.2   Analyze real-world business dilemmas and scenarios to make ethical decision considering the facts, stakeholders, and organizational codes of conduct.

    4.3   Identify alternatives to address current business ethics situations and conflicts.

    4.4   Explain how one's own values as well as business and industry culture are shaped by institutional, social, diversity, and other interpersonal contexts.

    4.5   Recognize and appreciate the complexity of ethical decision making in business organizations.

    4.6   Differentiate between legal and ethical business behavior.

    4.7   Describe different aspects of business social responsibility.

5. Business Global Awareness – Analyze the interconnectedness of global and local communities.

    5.1   Analyze business issues and events related to strategic decision-making in an international context.

    5.2   Incorporate diverse perspectives into business decision-making.

    5.3   Identify the challenges and opportunities that cultural and individual differences bring into the workplace and business environment.

    5.4   Explain the need to operate with civility and cooperation in a complex, and diverse international business environment.

    5.5   Identify similarities and difference in and among cultures, economies, business regulations, and political environments.

6. Business Knowledge/General – Understand the broad contexts of business and the specific knowledge, skills, and activities necessary to effectively function in the marketplace.

    6.1   Explain how the different business functions within an organization must work together to operate efficiently and effectively.

    6.2   Identify the purpose of the organizational mission.

    6.3   Identify how forces of the business environment (i.e., competitive, technological, economic, social and demographic, and regulatory) create opportunities and threats for businesses.

    6.4   Define specific, measurable, time-oriented business goals and objectives.

    6.5   Compare and contrast the forms of business ownership.

    6.6   Identify the importance of small business and entrepreneurship in the United States economy.

6.7   Describe the business cycle.

6.8   Explain the role of the stock exchanges in the financial markets.

6.9   Compare the different types of financing and the need for short- and long-financial planning.

6.10   Apply business principles to personal financial planning.

6.11   Differentiate between marketing, promotion, advertising, personal selling, sales promotion, public relations, and publicity.

6.12   Differentiate between consumer and organizational markets.

6.13   Define aspects of the marketing mix (e.g., differentiation, branding, Integrated Marketing Communications, intermediaries, marketing channel, value and pricing.)

6.14   Explain market share given industry-wide sales and individual firm sales.

6.15   Describe a target market using basic demographics and lifestyle variables.

6.16   Define management.

6.17   Describe the various functions of management.

6.18   Differentiate between the different levels and skills or managers.

6.19   Define leadership and recognize the different styles of leadership.

6.20   Define the role of human resource management.

6.21   Explain organizational charts and span of control.

6.22   Define the fundamentals of operations and supply chain management.

6.23   Explain the role of operations and supply chain management in an organization and its relationship to the other business functions.

7. Business Knowledge/Business Law – Understand the broad contexts of business and the specific knowledge, skills, and activities necessary to effectively function in the marketplace.

7.1   Explain basic legal terms and concepts.

7.2   Identify how United States laws and regulations govern business activity.

7.3   Explain the fundamental elements of dispute resolution in the United States.

7.4   Apply basic rules and principles from key areas of law to given business scenarios.

7.5   Analyze fact patterns using fundamental principles of business law in such areas as contracts, torts, property, administrative law, agency, and employment law.

7.6   Identify and discuss the nature and sources of law.

7.7   Differentiate lawsuits by type:

    7.7.1   Public from private
    7.7.2   State court from federal court
    7.7.3   Criminal from civil
    7.7.4   Contract from tort

7.8 Analyze current legal case articles to identify arguments for both sides of a legal dispute and form an opinion about which side should prevail.

8. Business Knowledge/Financial Accounting – Understand the broad contexts of business and the specific knowledge, skills, and activities necessary to effectively function in the marketplace.

8.1 Complete all the steps in the accounting cycle for basic corporate transactions.

8.2 Determine the impact of omissions or manipulations of required accrual-based adjustments on the financial statements.

8.3 Prepare the four financial statements required by Generally Accepted Accounting Principles (GAAP) including multi-step income statement and classified balance sheet for service and merchandising companies given an adjusted trial balance.

8.4 Explain the importance of internal controls related to business operations and accounting information.

8.5 Compute and account for cash, receivables, and uncollectible accounts.

8.6 Prepare general journal entries and supporting computations for both perpetual and periodic inventory systems using acceptable inventory flow assumptions.

8.7 Estimate end-of-period inventory values using gross margin and retail inventory methods.

8.8 Compute and account for property, plant, and equipment, including purchases, depreciation, and disposals.

8.9 Compute and account for intangible assets and natural resources including purchases, amortization, disposal, and depletion.

8.10 Calculate the current and subsequent period costs for current liabilities both known and estimated.

8.11 Compute and account for long-term bonds including supporting computations under both the straight-line and effective interest methods.

8.12 Prepare entries for transactions related to stockholder's equity including issuance of stock, treasury stock, stock splits, cash dividends, and stock dividends. Construct the balance sheet presentation for stockholder's equity.

8.13 Compute and account for reconciling accrual-based net income to cash-based income from operations by preparing the statement of cash flows using both direct and indirect methods.

8.14 Analyze financial statements and draw conclusions using financial statement ratios, horizontal and vertical analyses, intra-company, trend analyses, common-sized statements, and benchmarking.

9. Business Knowledge/Managerial Accounting – Understand the broad contexts of business and the specific knowledge, skills, and activities necessary to effectively function in the marketplace.

9.1 Explain the differences between managerial accounting and financial accounting.

9.2 Explain how managerial accounting information can be used to improve planning and control decisions.

9.3 Explain cost terminology, including the difference between a product cost and a period cost.

9.4 Compute cost flows in service, merchandising, and manufacturing organizations. For manufacturing organizations, track costs through materials, work-in-process, and finished goods inventory accounts.

9.5 Perform cost allocations and apply overhead costs to work-in process inventory using a pre-determined rate.

9.6 Record journal entries and provide supporting calculations associated with job costing, process costing, and activity-based costing.

9.7 Estimate fixed and variable costs using the account classification method and the high-low method.

9.8 Develop a cost-volume-profit (CVP) model and be able to use the model to perform breakeven analysis, profit planning, decision making, and assess operating risk.

9.9 Use managerial accounting information to make short-term decisions, including accepting a special order, running a promotion, make versus buy, and the allocation of a scarce resource.

9.10 Develop operating budgets; include revenue, production, cost of goods manufactured, and cost of goods sold budgets.

9.11 Link operating budgets to develop a master budget, including a budgeted income statement and a cash budget.

9.12 Develop a flexible budget.

9.13 Perform variance analysis, including computing the total profit variance, the sales volume variance, the sales price variance, material quantity and price variances, labor quantity and price variances, and the fixed cost spending variance.

9.14 Calculate income and ending inventory values using both absorption costing and variable costing and reconcile the differences in income and inventory between these two approaches.

9.15 Use discounted cash flow techniques to compute a project's net present value (NPV) and internal rate of return (IRR).

9.16 Compute a project's payback period and accounting rate of return (ARR).

9.17   Describe the benefits and costs of decentralization and the different types of responsibility centers.

9.18   Describe transfer pricing and measure investment center performance by computing return on investment (ROI) and residual income (RI).

9.19   Explain the role managerial accounting plays in guiding a firm's strategy and the value chain.

9.20   Describe the balanced scorecard and life-cycle analysis.

10. Business Knowledge/Macroeconomics – Understand the broad contexts of business and the specific knowledge, skills, and activities necessary to effectively function in the marketplace.

10.1   Identify, describe, and relate basic macroeconomic variables to their respective macroeconomic objectives, including short-run and long-run implications.

10.2   Define, explain, and solve problems related to the function of basic fiscal policy.

10.3   Define and explain how money, banks, and monetary policy function and how they are related.

10.4   Explain the macroeconomic implications of Federal budgets.

10.5   Explain and illustrate how money and interest rates are related.

10.6   Explain international trade in a macroeconomic context.

10.7   Describe current events from a macroeconomic perspective.

10.8   Identify sources of internet-based data useful for evaluating economic activity from a macroeconomic perspective.

10.9   Describe and discuss alternative measures of macroeconomics performance and their limitations.

10.10   Demonstrate how supply and demand interact to determine market prices.

10.11   Describe the financial institutions of the economy and their influence on macroeconomic activity.

10.12   Evaluate the effectiveness of alternative economic stabilization policies.

10.13   Describe the basis of, and gains from, international trade.

10.14   Analyze the consequences of trade for international financial flows.

10.15   Compare and contrast various schools of thought with regard to monetary and fiscal policy.

10.16   Explain and illustrate the concepts of inflation, unemployment, and Gross Domestic Product (GDP).

10.17   Explain the theories of employment, output, income, and economic growth.

10.18   Define aggregate demand and aggregate supply in reference to determining price level.

10.19   Explain the currency market and its effect on international trade.

10.20   Explain price and income elasticities and their tax implications.

11. Business Knowledge/Microeconomics – Understand the broad contexts of business and the specific knowledge, skills, and activities necessary to effectively function in the marketplace.

   11.1   Describe core economic concepts of microeconomics that are essential to good decision making and informed analyses of economic issues.
   11.2   Describe the consequences of scarcity of resources.
   11.3   Explain and apply the concept of opportunity cost, production possibility curves, and marginal analysis.
   11.4   Explain consumer behavior in terms of demand for products.
   11.5   Solve problems containing the following features of demand: demand curve, quantities demanded, movement long the demand curve, and shifts in demand.
   11.6   Explain firm behavior in terms of production.
   11.7   Solve problems containing the following features of supply: supply curve, quantity supplied, movement along supply curve and shifts in supply.
   11.8   Describe equilibrium between demand and supply, impacts of surpluses, shortages, and comparative static analysis shifts in demand and supply.
   11.9   Describe elasticity and the consequences of price floor and price ceiling. Relate them to real life economic issues such as minimum wage laws and rent control.
   11.10 Analyze the performance of firms under different market structures.
   11.11 Explain the role of government where market results are not optimal.
   11.12 Explain the impact of various aspects of production costs and levels of competition.
   11.13 Describe the resource markets and why earnings differ.
   11.14 Identify and explain the major forces impacting the distribution of income and wealth.
   11.15 Critically analyze economic arguments put forth in public policy debates. Use economic analysis to evaluate controversial issues and policies.

12. Business and Professional Skills – Develop a range of professional and interpersonal skills needed in business settings.

   12.1   Articulate a personal definition of success.
   12.2   Evaluate and compare personal attributes, interests, cultural/ethical influences, and desired work rewards with various business majors and potential career opportunities to develop an academic and career plan.
   12.3   Develop a resume to articulate the student's work, organizational, and volunteer skills to potential employers and/or educational programs.
   12.4   Explain the advantages of social media as a source of information gathering to network with professionals and exchange career information.
   12.5   Identify resources for academic and professional development.

12.6   Demonstrate college level success strategies and skills.

12.7   Discuss the importance of community engagement and giving back to the community.

12.8   Discuss how and why learning is a lifetime activity that requires constant exploration of new concepts and ideas.

12.9   Demonstrate effective personal interview skills including an elevator pitch.

12.10   Demonstrate appropriate business etiquette.

12.11   Explain how cultural customs impact business etiquette.

12.12   Develop a professional business image.

12.13   Utilize traditional and digital tools for job search.

13. Business Technology – Identify and use appropriate technology to communicate and solve business problems and aid in decision making.

13.1   Explain the purpose of information systems to support organizations and enhance productivity.

13.2   Explain the physical components and operation of microcomputers.

13.3   Employ database capabilities, functions, and skills to solve business problems.

    13.3.1   Design a table in a relational database program.

    13.3.2   Build simple and aggregate queries.

    13.3.3   Build queries with formulas.

    13.3.4   Queries (pattern match, list of values, parameter, and/or, calculated fields, aggregate functions).

    13.3.5   Build and modify reports from tables and queries.

    13.3.6   Create and modify forms from tables and queries.

13.4   Employ spreadsheet capabilities, functions, and skills to solve business problems.

    13.4.1   Round, charts, spreadsheet design (organization of data and labels), locking cells.

    13.4.2   Logical (Nested IF) Function: Given criteria, correctly enter nested IF function. Employ And, Or, CountIF, SumIF, AverageIF as needed.

    13.4.3   Logical (VLOOKUP) Function: Given criteria, correctly enter nested VLOOKUP function.

    13.4.4   Financial functions – FV, PMT, IPMT, PPMT.

    13.4.5   Computation functions – SUM, Average, Max, Min.

    13.4.6   Absolute & relative references: Use absolute cell references in appropriate places. Employ 3-D and linking as needed.

    13.4.7   Linking Worksheets: Correctly demonstrate an understanding of how worksheets can be linked.

    13.4.8   Scenarios, solver, macros.

13.4.9   Table and Pivot Table: Given sample design, define table and create Pivot Table and Data Table.

13.4.10   Data management tools: Sort, subtotals, filter, and range names.

13.5   Explain the difference between computer operating systems and user software programs.

13.6   Identify when to use appropriate features within a software application.

13.7   Utilize internet applications and "cloud" technologies in business situations.

13.8   Utilize presentation software.

13.9   Utilize work processing software.

13.10   Utilize collaboration technologies.

13.11   Explain security goals, response to threats, and safeguards.

13.12   Discuss issues related to the ethical use of information technology.

14. Integrated Problem Solving – Synthesize and analyze information and ideas from multiple sources and perspective to solve challenging problems.

14.1   Identify essential information needed to make an informed business decision.

14.2   Evaluate the validity and completeness of information obtained.

14.3   Apply critical and creative thinking skills to make informed business decisions using pertinent data.

14.4   Develop and communicate well-supported conclusions when solving problems by evaluating both quantitative and qualitative information.

14.5   Explain the interdependencies of ethical, legal, and regulatory information in the business decision making process.

14.6   State the important roles and responsibilities of business leaders with respect to the primary stakeholders of an organization.

15. Teamwork – Use teamwork skills to participate effectively in team problem-solving and decision-making situations.

15.1   Utilize inquiry, critical thinking, decision making, advocacy, and communication skills to identify the positive and negative behaviors associated with group interaction.

15.2   Demonstrate effective interpersonal skills.

15.3   Collaborate harmoniously with people from similar and diverse backgrounds to make business decisions, documents, and presentation meeting established deadlines.

15.4   Utilize skills for coping with stressful team situations (i.e., team members not fully participating).

15.5   Offer alternatives that build on the ideas of others.

15.6   Demonstrate delegation skills.

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02.11.2015

Pathway: Computer Science

Preamble: See document on page 2.

Executive Summary:

1. Exposure to Discrete Structures
   a. Should include all Core Tier-1 learning outcomes identified in ACM/IEEE CS2013 curricula.
   b. Includes topics and learning outcomes normally included in a rigorous Discrete Structures course in a Computer Science major.
   c. See below for a list of learning outcomes. The full ACM/IEEE CS2013 curricula are available at http://www.acm.org/education/CS2013-final-report.pdf.
2. Exposure to Software Development Fundamentals
   a. Should include all Core Tier-1 learning outcomes identified in ACM/IEEE CS2013 curricula.
   b. This includes topics and learning outcomes normally included in the first three Computer Science courses in many Computer Science majors. Students master fundamental aspects of software development/programming and data structures and algorithms.
   c. See below for list of learning outcomes. The full ACM/IEEE CS2013 curricula are available at http://www.acm.org/education/CS2013-final-report.pdf.
3. Calculus I and II
   a. Rigorous treatment of differential and integral calculus, i.e., "for math majors" versions of the courses – titled simply "Calculus 1" and "Calculus 2" in the Core Transfer Library at www.transferIN.net/ctl.
4. A lab science (physics, biology, chemistry)
   a. Rigorous study of physics, biology, or chemistry, including laboratories, i.e., "for majors" versions of the courses – titled "Biology 1 and 2 with Lab" and similarly for Chemistry and Physics in the Core Transfer Library at www.transferin.net.ctl.

Competencies and Learning Outcomes:

1. Discrete Structures
   1.1 Explain with examples the basic terminology of functions, relations, and sets. [Familiarity]
   1.2 Perform the operations associated with sets, functions, and relations. [Usage]
   1.3 Relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context. [Assessment]
   1.4 Convert logical statements from informal language to propositional and predicate logic expressions. [Usage]

1.5   Apply formal methods of symbolic propositional and predicate logic, such as calculating validity of formulae and computing normal forms. [Usage]

1.6   Use the rules of inference to construct proofs in propositional and predicate logic. [Usage]

1.7   Describe how symbolic logic can be used to model real-life situations or applications, including those arising in computing contexts such as software analysis (e.g., program correctness), database queries, and algorithms. [Usage]

1.8   Apply formal logic proofs and/or informal, but rigorous, logical reasoning to real problems, such as predicting the behavior of software or solving problems such as puzzles. [Usage]

1.9   Describe the strengths and limitations of propositional and predicate logic. [Familiarity]

1.10   Identify the proof techniques used in a given proof. [Familiarity]

1.11   Outline the basic structure of each proof technique (direct proof, proof by contradiction, and induction) described in this using. [Usage]

1.12   Apply each of the proof techniques (direct proof, proof by contradiction, and induction) correctly in the construction of a sound argument. [Usage]

1.13   Determine which type of proof is best for a given problem. [Assessment]

1.14   Explain the parallels between ideas of mathematical and/or structural induction to recursion and recursively defined structures. [Assessment]

1.15   Explain the relationship between weak and strong induction and give examples of the appropriate use of each. [Assessment]

1.16   Apply counting arguments, including sum and product rules, inclusion-exclusion principle and arithmetic/geometric progressions. [Usage]

1.17   Apply the pigeonhole principle in the context of a formal proof. [Usage]

1.18   Compute permutations and combinations of a set, and interpret the meaning in the context of the particular application. [Usage]

1.19   Map real-world applications to appropriate counting formalisms, such as determining the number of ways to arrange people around a table, subject to constraints on the seating arrangement, or the number of ways to determine certain hands in cards (e.g., a full house). [Usage]

1.20   Solve a variety of basic recurrence relations. [Usage]

1.21   Analyze a problem to determine underlying recurrence relations. [Usage]

1.22   Perform computations involving modular arithmetic. [Usage]

1.23   Illustrate by example the basic terminology of graph theory, as well as some of the properties and special cases of each type of graph/tree. [Familiarity]

1.24   Demonstrate different traversal methods for trees and graphs, including pre-, post-, and in-order traversal of trees. [Usage]

1.25 Model a variety of real-world problems in computer science using appropriate forms of graphs and trees, such as representing a network topology or the organization of a hierarchical file system. [Usage]

1.26 Show how concepts from graphs and trees appear in data structures, algorithms, proof techniques (structural induction), and counting. [Usage]

1.27 Calculate probabilities of events and expectations of random variables for elementary problems such as games of chance. [Usage]

1.28 Differentiate between dependent and independent events. [Usage]

1.29 Identify a case of the binomial distribution and compute a probability using that distribution. [Usage]

1.30 Apply Bayes' theorem to determine conditional probabilities in a problem. [Usage]

1.31 Apply the tools of probability to solve problems such as the average case analysis of algorithms or analyzing hashing. [Usage]

2. Software Development Fundamentals

2.1 Discuss the importance of algorithms in the problem-solving process. [Familiarity]

2.2 Discuss how a problem may be solved by multiple algorithms, each with different properties. [Familiarity]

2.3 Create algorithms for solving simple problems. [Usage]

2.4 Use a programming language to implement, test, and debug algorithms for solving simple problems. [Usage]

2.5 Implement, test, and debug simple recursive functions and procedures. [Usage]

2.6 Determine whether a recursive or iterative solution is most appropriate for a problem. [Assessment]

2.7 Implement a divide-and-conquer algorithm for solving a problem. [Usage]

2.8 Apply the techniques of decomposition to break a program into smaller pieces. [Usage]

2.9 Identify the data components and behaviors of multiple abstract data types. [Usage]

2.10 Implement a coherent abstract data type, with loose coupling between components and behaviors. [Usage]

2.11 Identify the relative strengths and weaknesses among multiple designs or implementations for a problem. [Assessment]

2.12 Analyze and explain the behavior of simple programs involving the fundamental programming constructs variables, expressions, assignments, I/O, control constructs, functions, parameter passing, and recursion. [Assessment]

2.13 Identify and describe uses of primitive data types. [Familiarity]

2.14 Write programs that use primitive data types. [Usage]

2.15 Modify and expand short programs that use standard conditional and iterative control structures and functions. [Usage]

2.16 Design, implement, test, and debug a program that uses each of the following fundamental programming constructs: basic computation, simple I/O, standard conditional and iterative structures, the definition of functions, and parameter passing. [Usage]

2.17 Write a program that uses file I/O to provide persistence across multiple executions. [Usage]

2.18 Choose appropriate conditional and iteration constructs for a given programming task. [Assessment]

2.19 Describe the concept of recursion and give examples of its use. [Familiarity]

2.20 Identify the base case and the general case of a recursively-defined problem. [Assessment]

2.21 Discuss the appropriate use of built-in data structures. [Familiarity]

2.22 Describe common applications for each of the following data structures: stack, queue, priority queue, set, and map. [Familiarity]

2.23 Write programs that use each of the following data structures: arrays, records/structs, strings, linked lists, stacks, queues, sets, and maps. [Usage]

2.24 Compare alternative implementations of data structures with respect to performance. [Assessment]

2.25 Describe how references allow for objects to be assessed in multiple ways. [Familiarity]

2.26 Compare and contrast the costs and benefits of dynamic and static data structure implementations. [Assessment]

2.27 Choose the appropriate data structure for modeling a given problem. [Assessment]

2.28 Trace the execution of a variety of code segments and write summaries of their computations. [Assessment]

2.29 Explain why the creation of correct program components is important in the production of high-quality software. [Familiarity]

2.30 Identify common coding errors that lead to insecure programs (e.g., buffer overflows, memory leaks, malicious code) and apply strategies for avoiding such errors. [Usage]

2.31 Conduct a personal code review (focused on common coding errors) on a program component using a provided checklist. [Usage]

2.32 Contribute to a small-team code review focused on component correctness. [Usage]

2.33 Describe how a contract can be used to specify the behavior of a program component. [Familiarity]

2.34 Refractor a program by identifying opportunities to apply procedural abstraction. [Usage]

2.35 Apply a variety of strategies to the testing and debugging of simple programs. [Usage]

2.36 Construct, execute and debug programs using a modern IDE and associated tools such as unit testing tools and visual debuggers. [Usage]

2.37 Construct and debug programs using the standard libraries available with a chosen programming language. [Usage]

2.38 Analyze the extent to which another programmer's code meets documentation and programming style standards. [Assessment]

2.39 Apply consistent documentation and program style standards that contribute to the readability and maintainability of software. [Usage]

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12.12.2014

Pathway: Criminal Justice

Preamble: See document on page 2.

Competencies and Learning Outcomes:

1. History, Systems and Processes
    1.1 Describe the historical development, organization and function of the criminal justice system.
    1.2 Discuss the interrelationship of each component of the criminal justice system, including policing, courts, and correction.
    1.3 Describe the contributions of key figures in American criminal justice and legal history.
    1.4 Define discretion and identify ways discretion is employed in criminal justice.
2. Law
    2.1 Discuss important historical developments as they relate to criminal law, particularly the constitutional foundations of criminal law.
    2.2 Identify the principles of substantive and/or procedural criminal law.
    2.3 Identify ways that political and social context affects definitions of crime, as well as the development and application of criminal law.
3. Theory
    3.1 Identify different theoretical frameworks to explain the function of the criminal justice system (e.g., due process).
    3.2 Describe the different theoretical frameworks to explain criminal behaviors.
    3.3 Discuss the nature and extent of crime and identify some basic issues in measuring crime.
4. Policy
    4.1 Identify current criminal justice policies to reduce crime and punish and rehabilitate offenders.
    4.2 Discuss the factors that affect criminal justice decision making.
5. Ethics
    5.1 Discuss the historical development of ethical standards in criminal justice
    5.2 Demonstrate an awareness of current ethical standards in criminal justice.
    5.3 Identify current ethical issues in criminal justice.
6. Diversity
    6.1 Recognize ways that diversity impacts the criminal justice system.
    6.2 Demonstrate the ability to interact with people from diverse backgrounds.
    6.3 Discuss and consider perspective of people from diverse backgrounds.
7. Scientific Methods – Addressed at AS level through general education core.
8. Communication – Addressed at AS level through general education core.
9. Critical Thinking/Problem Solving – Addressed at AS level through general education core.

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Pathway: Early Childhood Education

Preamble: See document on page 2.

Executive Summary: Associate degree students show mastery in the following educational skills that support their ability to gain competence in relation to the core standards, as outlined by National Association for the Education of Young (NAEYC) Standards for Associate degree programs.

- Promoting Child Development and Learning
- Building Family and Community Relationships
- Observing, Documenting, and Assessing to Support Young Children and Families
- Using Developmentally Effective Approaches
- Using Knowledge to Build Meaningful Curriculum
- Becoming a Professional
- Early Childhood Field Experiences

Mastery of these skills supports students in making better use of learning opportunities provided in the degree program.

Learning objectives reflect NAEYC Standards for Early Childhood Professionals in Associate Degree Programs (2010). Students successfully complete up to 30 hours of program coursework.

These standards and paired competencies will be informed by goals and objectives specified within the Indiana Core Knowledge and Competencies Document published by the Indiana Professional Development Network in 2013. The Indiana Early Care and Education and Youth Core Knowledge and Competencies (infants, toddlers, preschoolers, children and youth) provides general direction for what educators need to know and be able to do in order to work effectively with children/ youth and their families. It also includes expectations for assessment and evaluation across five levels, from entry into the field to professionals with an advanced degree. The document can be accessed at the following: http://www.in.gov/fssa/files/Indiana_Core_Knowledge_and_Competencies_First_Edition_4_13.pdf.

Competencies and Learning Outcomes:

1. Promoting Child Development and Learning – describes developmental domains and processes; describes a range of specific influences on child development and learning; and describes the connections between developmental knowledge and the creation of learning environments.

    1.1 Identify and compare various theories that explain child development and learning

     1.2 Analyze the multiple influences on the development and learning of young children

     1.3 Begin to apply developmental knowledge to create challenging and inclusive learning environments for young children

2. Building Family and Community Relationships – knowing about and understanding diverse family and community characteristics; supporting and engaging families and communities through respectful, reciprocal relationships, involving families and communities in their children's development and learning

     2.1 Demonstrate an awareness of and respect for diverse family and community characteristics

     2.2 Exhibit ability to engage families and communities through respectful, reciprocal relationships

     2.3 Articulate the importance of partnership with families and communities to support young children's development and learning

3. Observing, Documenting, and Assessing to Support Young Children – understanding the goals, benefits, and uses of assessment, knowing about and using observation, documentation, and other appropriate assessment tools and approaches, understanding and practicing responsible assessment to promote positive outcomes for each child, knowing about assessment partnerships with families and with professional colleagues.

     3.1 Identify the goals, benefits, and uses of assessment

     3.2 Utilize observation and documentation, and explore other appropriate assessment tools and approaches

     3.3 Articulate the ethics of responsible assessment to promote positive outcomes for each child

     3.4 Explain the benefits of partnering with families and professional colleagues in regard to assessment

4. Using Developmentally Effective Approaches – understanding positive relationships and supportive interactions as the foundation of their work with children, knowing and understanding effective strategies and tools for early education, using a broad repertoire of developmentally appropriate teaching/learning approaches, reflecting on their own practice to promote positive outcomes for each child

     4.1 Define developmentally and culturally appropriate practices

     4.2 Articulate the value of positive relationships and supportive interactions as the foundation of their work with children

     4.3 Examine and reflect upon effective strategies and tools for early education

     4.4 Implement a repertoire of developmentally appropriate teaching/learning approaches

     4.5 Analyze personal practice to promote positive outcomes for each child

5. Using Content Knowledge to Build Meaningful Curriculum – understanding content knowledge and resources in academic disciplines, knowing and using the central

concepts, inquiry tools, and structures of content areas or academic disciplines, using their own knowledge, appropriate early learning standards, and other resources to design, implement, and evaluate meaningful, challenging curricula for each child.

    5.1 Demonstrate knowledge and utilize resources in content areas or academic disciplines

    5.2 Apply the central concepts, inquiry tools, and structures of content areas or academic disciplines

    5.3 Integrate content knowledge, appropriate early learning standards, and other resources to design, implement, and evaluate meaningful curricula for each child

6. Becoming a Professional – identifying and involving oneself with the early childhood field, knowing about and upholding ethical standards and other professional guidelines, engaging in continuous, collaborative learning to inform practice, integrating knowledgeable, reflective, and critical perspectives on early education, engaging in informed advocacy for children and the profession.

    6.1 Identify the role of professional organizations in the field of early childhood education

    6.2 Demonstrate the relationship of ethical standards to professional practice

    6.3 Engage in collaborative learning to inform practice

    6.4 Use technology responsibly with young children, families, and other professionals

    6.5 Advocate for children, families, and the profession

7. Early Childhood Field Experiences – experiences through which to develop the knowledge, skills, and professional dispositions necessary to promote the development and learning of young children across the entire developmental period of early childhood

    7.1 Observe and practice in at least two of the three early childhood age groups (birth-age 3, 3-5, 5-8)

    7.2 Observe and practice in at least two of the three main types of early education settings (early school grades, child care centers and homes, Head Start programs)

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Pathway: Elementary Education

Preamble: See document on page 2.

Executive Summary:

At the request of the Indiana Commission on Higher Education, a leadership team was formed to identify learning outcomes for associate degree students anticipating entering a four-year institution in pursuit of an elementary education teaching license.

Members of the Leadership Team affirmed the first two years of a teacher preparation program builds the foundation for later success. It is a critical time for students to examine and evaluate their dispositions and competencies. Initial preparation programs must be sensitive to and advise students about ever changing state, licensure, and accreditation requirements.

Recognizing a bench mark for entry to a four year institution is demonstrated competence in reading, writing, and mathematics through passing scores on the CASA (Core Academic Skills Assessment) or other approved assessment, content reflects the Elementary Generalist Educator Standards and essential content knowledge needed by prospective teachers.

Using the current Indiana Elementary Generalist Educator Standards the team outlined 8 competencies and accompanying learning outcomes to meet the task of creating a single pathway for this group of students.

The approved competencies include:

1. Content

1.1 Beginning professionals show mastery of traditional educational content/skills for successful entry to a 4-year institution based on Indiana Educator Standards.

2. Child Development

2.1 Beginning Professionals have a broad understanding and knowledge of how children learn.

3. Clinical Practice

3.1 Beginning professionals will have exposure to and experience with children in a learning environment.

4. Dispositions

4.1 Beginning professionals demonstrate a broad understanding of professional roles and responsibilities as well as ethics of the profession.

4.2 Beginning professionals demonstrate and exhibit positive, ethical, appropriate, caring, committed, respectful, and professional behaviors (writing, speaking, collaboration, communication).

5. Pedagogy

5.1 Beginning professionals demonstrate an understanding of the pedagogy of teaching and learning.

6. Technology

6.1 Beginning professionals will be able to utilize technology for teaching and learning.

7. Individual Difference

7.1 Beginning professionals will be aware of individual differences in learners including ENL, special education, gifted/talented, and developmental delays.

8. Cultural Competence

8.1 Beginning professionals will explore the role of cultural competence in teaching and learning including family, race, community, and SES.

Competencies and Learning Outcomes:

1. Content
   1.1 Beginning professionals show mastery of traditional educational content/skills for successful entry to a 4-year institution based on Indiana Educator Standards.
2. Child Development
   3.1 Beginning Professionals have a broad understanding and knowledge of how children learn.
3. Clinical Practice
   3.1 Beginning professionals will have exposure to and experience with children in a learning environment.
4. Dispositions
   4.1 Beginning professionals demonstrate a broad understanding of professional roles and responsibilities as well as ethics of the profession.
   4.2 Beginning professionals demonstrate and exhibit positive, ethical, appropriate, caring, committed, respectful, and professional behaviors (writing, speaking, collaboration, communication).
5. Pedagogy
   5.1 Beginning professionals demonstrate an understanding of the pedagogy of teaching and learning.
6. Technology
   6.1 Beginning professionals will be able to utilize technology for teaching and learning.
7. Individual Difference
   7.1 Beginning professionals will be aware of individual differences in learners including ENL, special education, gifted/talented, and developmental delays.

8. Cultural Competence
   8.1 Beginning professionals will explore the role of cultural competence in teaching and learning including family, race, community, and SES.

Note: 4-year institutions will cover outcomes identified for both the 2 and 4-year institutions.

Approved 02.26.15

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Pathway: Secondary Education

Preamble: See document on page 2.

Competencies and Learning Outcomes:

Note on Content Areas: The learning outcomes for each content area will be determined by the respective content faculty.

1. Adolescent Development
    1.1 Beginning secondary education teacher candidates have an emerging understanding of adolescent development and diversity.
        1.1.1 Demonstrate an emerging understanding of adolescent cognitive, social, emotional, physical and moral development.
        1.1.2 Demonstrate an emerging understanding of how culture, economic background, linguistics background, gender, religion and family structure impact adolescents.
2. Instructional Technology
    2.1 Beginning secondary education teacher candidates demonstrate an understanding of software and educational technologies associated with operations and concepts for instruction and use of technology to enhance productivity, efficiency and professional practice.
        2.1.1 Demonstrate an understanding, evaluate and select information, sources, and digital tools based on the appropriateness to specific tools.
        2.1.2 Apply instructional technology to generate ideas, products or processes.
3. Diversity/Multicultural Issues
    3.1 Beginning secondary education teacher candidates demonstrate understanding and awareness of diverse adolescent abilities and their influence on instructional needs.
    3.2 Beginning secondary education teacher candidates demonstrate an understanding of how culture, economic background, linguistics background, gender, religion and family structure influence the learning of adolescents.
    3.3 Beginning secondary education teacher candidates demonstrate sensitivity to varying adolescent abilities and diversity.
4. Roles and Responsibilities of Educators
    4.1 Beginning secondary education teacher candidates have an emerging understanding of professional roles and responsibilities.
        4.1.1 Demonstrate an understanding of the ethics of the profession, e.g. confidentiality, plagiarism.

        4.1.2   Demonstrate ability to collaborate and communicate with peers, students and education professionals.

        4.1.3   Understand the appropriate use of social networking and/or electronic communication with peers, students, and education professionals.

        4.1.4   Recognize varying roles of teachers in schools and community.

5. Educational Learning Theory

    5.1 Beginning secondary education teacher candidates will demonstrate an emerging understanding of contemporary learning theories and theories of motivation and how development occurs according to these theories.

        5.1.1   Demonstrate an emerging understanding of how adolescents construct meaning based on different learning theories.

        5.1.2   Demonstrate an emerging understanding of how adolescents respond to instructional strategies and learning environments based on different motivation theories.

6. History and Philosophy of Education

    6.1 Beginning secondary education teacher candidates will acquire an emerging understanding of the historical, philosophical, ethical, and legal foundations of the field.

        6.1.1   Demonstrate an emerging understanding of key historical events that have influenced American public education.

        6.1.2   Demonstrate an emerging understanding of key philosophical orientations that have influences American public education.

        6.1.3   Demonstrate an emerging understanding of legal influences of American public education.

        6.1.4   Demonstrate and emerging understanding of the inherent value of equity in American public education.

7. Clinical Experiences

    7.1 Beginning secondary education teacher candidates will demonstrate sensitivity to varying adolescent abilities and diversity through experiences in both community and school settings.

    7.2 Beginning secondary education teacher candidates will acquire a familiarity with current secondary school settings.

    7.3 Beginning secondary education teacher candidates will demonstrate appropriate professional dispositions, presentation and behaviors, e.g., collegiality, ability to self-assess accurately.

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Pathway: Special Education

Preamble: See document on page 2.

Executive Summary: The leadership team for the Special Education pathway identified the overall learning outcomes needed for Indiana teaching licensure. These outcomes, based on Indiana and the Council for Exceptional Children standards, were then divided to articulate what may be addressed within the first two years (at 2-year institutions) and what would be required across the entire four years (at 4-year institutions). While these outcomes and competencies specifically identify the requirements for meeting special education content, no information was outlined for meeting other teacher education content requirements. Thus, caution should be used when advising students at 2-year institutions who anticipate finishing their degree at a 4-year institution to ensure that they are also completing coursework that address general foundational teacher education content that are not specific to special education. In addition, these students and their advisors should regularly confer with 4-year institutions to identify additional critical content required for degree completion. It should also be noted that acceptance to a 4-year institution is not guaranteed simply because a student completes the articulated pathway. He or she must still meet the admission requirements and be accepted by the institution to which he/she seeks to transfer.

The following competencies represent the general learning outcomes for the first two years in special education:

Competencies and Learning Outcomes:

1. Characteristics
    1.1 Beginning professionals understand how exceptional learners interact with development and learning;
        1.1.1 Aware of current law and practices, definitions, categories
        1.1.2 Understanding needs and characteristics of exceptionalities
2. Human/Child Development
    2.1 Beginning professionals demonstrate a broad understanding of development and diversity.
3. Instructional Technology
    3.1 Design and use of emerging technologies, broad and comprehensive understanding of software and technologies, technology integration management, and teaching methods.
4. Diversity/Multicultural Issues
    4.1 Professionals understand how language, culture and family background influence the learning of students with exceptionalities.
5. Roles and Responsibilities of Educators

     5.1 Teachers have broad and comprehensive understanding of professional roles and responsibilities of SPED teacher.

     5.2 Understand ethics of the profession.

6. Educational Learning Theory

     6.1 Describes contemporary learning theories, how development occurs according to these theories, describe and explain theories of motivation.

7. History and Philosophy of Education

     7.1 Beginning professionals demonstrate broad and comprehensive understanding of the historical philosophical, ethical, and legal foundations in the field.

8. Reading Instruction

     8.1 Beginning professionals have a general understanding of reading development, disciplinary and content area literacy skills.

9. Content Instruction

    9.1 Science –

- Biology-scientific inquiry, data recording, ecosystems, biological energy, cell structure and function, meiosis, genetics, diversity, evolution, and human body systems
- Earth Science – fundamental earth science concepts
- Physics - mechanics and the application of Newton's laws of motion to analyze the motion of various objects

    9.2 English – English composition, literature, linguistics

    9.3 Communications – Public speaking

    9.4 History –

- World History – Introduction to the modern world and survey of global history, OR
- American History – American History to 1877 and since 1877

    9.7 Mathematics – College algebra, Geometry

    9.8 Language – foreign language (3rd level)

10. Assessment – use of assessment technique in special education. Includes assessment literacy; critical functional assessment approaches; characteristics of the major clinical, psychological and educational tests for special education; identify learning styles of students with disabilities; develop an understanding of the educational options and accommodations for various exceptionalities based on assessment.

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Pathway: Electrical Engineering Technology

Preamble: See document on page 2.

Executive Summary:

After May 15, 2015, students who satisfactorily complete the requirements of an Associate degree at ITCC or VU in EET and are admitted into a baccalaureate EET program at an Indiana higher education institution will not be required to repeat the courses associated with the Indiana SAP Electrical Engineering Technology Core requirements, at the institution to which the student transfers. This SAP establishes a framework for the Indiana Electrical Engineering Technology Core, divided into seven competency areas. The seven key competencies include:

1. Mathematics
2. Physical Sciences
3. Electrical and Electronic Systems
4. Computing
5. Technology Proficiencies
6. Communications Skills
7. Teamwork, Ethics, and Professional Skills

All outcomes and competencies must follow the guidelines of ETAC/ABET (Engineering Technology Accreditation Commission of the Accreditation Board for Engineering and Technology). These outcomes are as follows:

A. For associate degree programs, these student outcomes must include, but are not limited to, the following learned capabilities:

a. an ability to apply the knowledge, techniques, skills, and modern tools of the discipline to narrowly defined engineering technology activities;

b. an ability to apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require limited application of principles but extensive practical knowledge;

c. an ability to conduct standard tests and measurements, and to conduct, analyze, and interpret experiments;

d. an ability to function effectively as a member of a technical team;

e. an ability to identify, analyze, and solve narrowly defined engineering technology problems;

f. an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;

g. an understanding of the need for and an ability to engage in self-directed continuing professional development;

      h. an understanding of and a commitment to address professional and ethical responsibilities, including a respect for diversity; and

      i. a commitment to quality, timeliness, and continuous improvement.

ABET EET competencies ("Program Criteria") recommended by IEEE:
(These 2 criteria are sometimes listed at the end of the above a-i list, or merged into a & b of the above list, in a school's list of ABET student outcomes.)
a. the application of circuit analysis and design, computer programming, associated software, analog and digital electronics, and microcomputers, and engineering standards to the building, testing, operation, and maintenance of electrical/electronic(s) systems.
b. the applications of physics or chemistry to electrical/electronic(s) circuits in a rigorous mathematical environment at or above the level of algebra and trigonometry.
Suggested competencies grouped by ETAC/ABET student outcomes:
ABET d. "an ability to function effectively as a member of a technical team;"

- Complete a narrowly defined technical project in a team of two or three students

ABET f. ". an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;"

- Present substantially error-free prose in narrative forms, laboratory and technical reports.
- Present technical explanations orally
- Locate, gather and organize information on an assigned technical topic
- Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions (DA10[i])

ABET g. "an understanding of the need for and an ability to engage in self-directed continuing professional development;"

- Identify opportunities to expand knowledge, skills, and abilities
- Recognize the need for, and have the ability to engage in independent updating in the context of specialized technical knowledge. (DA12[i])
- Undertake continuing professional development activities sufficient to maintain and extend his or her competence. (NC11[i])

ABET h. "an understanding of and a commitment to address professional and ethical responsibilities, including a respect for diversity;"

- Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well defined engineering problems. (DA6[i])
- Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts. (DA7[i])

- Understand and commit to professional ethics and responsibilities and norms of technician practice. (DA8[i])
- Recognize the reasonably foreseeable social, cultural and environmental effects of well-defined activities generally, and have regard to the need for sustainability; use engineering technical expertise to prevent dangers to the public. (NC6[i])
- Meet all legal and regulatory requirements and protect public health and safety in the course of his or her activities. (NC7[i])

ABET i. "a commitment to quality, timeliness, and continuous improvement."
- Meets deadlines
- Work presented with minimal errors
- Identify areas for improvement

References:
- "2014 - 2015 Criteria for Accrediting Engineering Technology Programs." Engineering Technology Accreditation Commission, ABET. http://abet.org/etac-criteria-2014-2015/
- "The Degree Qualifications Profile." Lumina Foundation. http://www.luminafoundation.org/publications/The_Degree_Qualifications_Profile.pdf
- "Graduate Attributes and Professional Competencies." by International Engineering Alliance http://www.ieagreements.org/IEA-Grad-Attr-Prof-Competencies.pdf

Competencies and Learning Outcomes:

1. Mathematics
   1.1 College Algebra
       1.1.1 Demonstrate the ability to simplify and perform operations on complex numbers, simplify rational expressions, simplify and perform operations on radicals, solve radical equations, solve quadratic and rational equations and inequalities, apply the concepts of ratio, proportion and combined variation, apply the properties of logarithms to solve exponential and logarithmic equations, solve polynomial equations and graph polynomial functions, graph exponential and logarithmic functions, graph rational functions, solve systems of equations with three variables, solve a variety of application problems in the above areas
       1.1.2 Use a scientific and/or graphing calculator proficiently as related to coursework
       1.1.3 Use computer technology which may include the Internet, the Web, e-mail or computer tutorials to enhance course objectives.
   1.2 Trigonometry

1.2.1 Convert between degree measure and radian measure, find trigonometric function values of any angle expressed in degree or radian measure, solve right triangles, solve oblique triangles using the laws of sine and cosine, use and apply properties of vectors, graph trigonometric functions, utilize trigonometric identities, solve trigonometric equations, convert between rectangular and polar coordinate systems, apply the properties of complex numbers in rectangular and polar forms, determine the features of a conic section from a standard equation, graph circles, parabolas, ellipses and hyperbolas

1.2.2 Use the above principals to solve practical applications.

1.2.3 Use a scientific/graphic calculator proficiently.

1.3 Calculus for Technologists

    1.3.1 Differentiate single variable functions (including logarithmic and exponential functions) and apply differentiation techniques

    1.3.2 Students will know how to integrate single variable functions and use methods of integration.

    1.3.3 Students will be able to differentiate and integrate transcendental functions and us Fourier series and Laplace transforms

    1.3.4 Students will be able to solve elementary differential equations.

2. Physical Sciences

    2.1 Physics (Mechanical Systems)

        2.1.1 Apply basic principles of momentum, energy, and angular momentum to microscopic and/or macroscopic systems including hands-on laboratory applications and computer simulations

        2.1.2 Measure physical quantities accurately using standard lab instruments.

3. Electrical and Electronic Systems

    3.1 Electricity, Analog Circuit Analysis and Design

        3.1.1 Define and calculate basic parameters of electric and magnetic fields

        3.1.2 Define and calculate key quantities: charge, current, voltage, power, energy

        3.1.3 Define and use the common components: R, L, C, transformers, diodes, BJT and MOS transistors, and op amps

        3.1.4 Use Ohm's Law, KVL, KCL, superposition, Thevenin's and Norton's Theorems to perform DC analysis and transient analysis on a given circuit.

        3.1.5 Use mesh and/or nodal analysis with 2 or more simultaneous equations to analyze resistive circuits

3.1.6 Calculate AC impedances and the steady state AC responses of basic RLC circuits.

3.1.7 Calculate effective and average values of periodic signals and calculate the instantaneous and average power.

3.1.8 Design simple amplifiers using transistors and/or op amps.

3.2 Digital Circuit Analysis and Design

3.2.1 Use binary and hexadecimal numbers system, Boolean expressions, and simplification/reduction concepts to analyze digital circuits.

3.2.2 Interpret and draw truth tables and logic timing diagrams.

3.2.3 Design, build, and troubleshoot simple circuits involving PKDs, FPGAs, TTL and/or CMOS combinational and sequential circuits.

3.2.4 Use gates, latches, flip-flops, RAM, ROM, A/D and D/A converters, and logic building blocks such as multiplexors, demultiplexors, encoders, decoders, adders, registers, counters magnitude comparators, and parity generators.

3.2.5 Analyze and design simple finite state machines (FSMs).

3.2.6 Use a hardware description language like VHDL as well as schematic representation to describe digital systems.

3.2.7 Translate between schematic representation, timing/state diagrams, tables, Boolean expressions, Hardware Description Language and written requirements for descriptions.

3.2.8 Use published data sheets to obtain I/O and timing parameters and apply these practical constraints to circuits.

3.3 Tools

3.3.1 Use circuit and system design/analysis software tools such as Multisim and Labview to capture schematics and/or block diagrams, simulate system behavior, and layout printed circuit boards.

3.3.2 Effectively use digital design/analysis tools such as Quartus or ISE to capture designs, simulate system behavior, and download designs to FPGAs or CPLDS.

3.3.3 Use standard lab instruments (DMM, oscilloscope, function generator, bench supply, etc.) to conduct experiments and collect measurements.

3.3.4 Solder/de-solder parts and wiring to construct printed circuit board systems.

3.3.5 Troubleshoot opens, shorts, and faulty components or subsystems.

4. Computing

4.1 Personal Computing

4.1.1 Use Microsoft Excel, Word, and PowerPoint, or equivalent tools, to create reports and present data.

4.1.2 Use spreadsheet software to input and analyze data.

4.2 Programming

4.2.1 Solve engineering problems using structured programming skills.

4.2.2 Write and debug programs in a high-level-language such as C, C++, or Basic, using integer and floating point variables, decision constructs and loops, bit manipulation, arrays, and functions to perform specific tasks.

4.3 Microcontrollers

4.3.1 Write and debug programs and configure microcontroller system hardware to solve typical control/acquisition engineering problems. The programs and systems should include bitwise I/O, various peripheral devices, interrupts, libraries, and Analog/Digital conversion.

5. Technology Proficiencies - Upon completion of the EET SAP Core Curriculum, students will develop a working knowledge of at least two of the following:

5.1 Data Communications and Networking

5.1.1 Design, implement, and manage small networks with switches and wireless access points, IP configuration.

5.1.2 Conduct basic configuration of more complex network equipment.

5.1.3 Understand the layered model of data protocols, such as TCP/IP.

5.1.4 Compare physical layer implementations such as fiber, USTP, coax, and wireless.

5.1.5 Understand and implement network and data security solutions.

5.1.6 Use standard networking tools to capture communications and analyze traffic.

5.2 Electric Energy Generation/Distribution

5.2.1 Explain the concepts and equipment for power generation: safety, generators, transformer, circuit breakers, 3-phase power, Y and Delta networks.

5.2.2 Analyze single and three phase circuits to calculate real, reactive, and apparent power, and transmission line characteristics.

5.2.3 Design basic power and motor circuits in accordance with applicable standards (NEC, etc.), including wire sizing, breakers/fusing, and overload protection.

5.2.4 Describe the types of electric motors, their characteristics, and applications.

5.2.5 Describe power management and alternative energy sources such as solar and wind.

5.3 Industrial Controls/Instrumentation

    5.3.1   Use Joint International Congress (JIC) standard drafting practices and symbols to read and write PLC programs, configure PLCs for typical industrial sensing and automation applications.

    5.3.2   Describe industrial robots and their applications.

    5.3.3   Choose and deploy transducers and signaling hardware.

    5.3.4   Implement motor circuits utilizing NEC standards.

5.4 RF Communications

    5.4.1   Explain and apply concepts of wireless communications, including frequencies, modulation schemes, antennas, transmitters, receivers, amplifiers, filters, attenuation and signal power, signal/noise ratio, PLLs, and mixers.

    5.4.2   Analyze and design RF circuits to meet a given need.

5.5 Advanced Computer Programming

    5.5.1   Employ relatively advanced concepts and algorithms in programming, such as number theory, object-oriented programming in C++ or Java, searching/sorting, structures, databases, graphics, and/or simulations.

5.6 Semiconductor Devices

    5.6.1   Explain the structure and function of various FET and bipolar technologies.

    5.6.2   Analyze and employ BJT and MOS transistors, thyristors, UJTs, analog ICs, and digital ICs.

    5.6.3   Analyze power, frequency response, and parasitics.

    5.6.4   Discuss testing and testability of integrated devices.

5.7 Small Signal Circuits/Systems

    5.7.1   Analyze, design, and build bipolar and FET transistor amplifiers.

    5.7.2   Classify amplifiers (A, AB, B, C, D) and analyze frequency response.

    5.7.3   Analyze, design, and build basic linear and switching power supplies.

6. Communications Skills

6.1 Written Communications

    6.1.1   Write effective layered reports (title, executive summary, main report, references, appendices) of appropriate length that are designed to meet the needs of multiple audiences.

6.2 Oral Communications

    6.2.1   Clearly communicate a technical or business message to one or many persons, using appropriate visual aids.

6.3 Graphical Communications

        6.3.1   Create clear and accurate electrical schematics, slide presentations, and other artifacts to communicate messages and data

   6.4 Information Literacy

        6.4.1   Be able to find and assess the quality of technical information sources

7. Teamwork, Ethics, and Professional Skills

   7.1 Professionalism – Appropriate dress, language, responsibility, and conduct in the job or school environment

   7.2 Teamwork - Work effectively in a team including different perspectives, gender, and cultures. Share the workload, communicate effectively, show leadership skills, set and meet deadlines, and conduct effective e team meetings.

   7.3 Ethics - Demonstrate an understanding of the ethical dilemmas that engineers and technologist face, and an awareness of the resources available to make ethical choices (e.g., conferring with management and/or ethics experts, following the code of ethics of professional organizations like IEEE, etc.)

   7.4 Respect for Diversity – Equally treat all persons, invite their input, and include them, regardless of age, disability, gender political viewpoint, race, nationality, religion, etc.

   7.5 Commitment to continuing professional development, via classes, professional societies, trade publications, certifications, et al.

   7.6 Commitment to quality, timeliness, and continuous improvement.

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*Denotes co-chairs for this panel.

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09.19.2014

Pathway: Information Technology and Informatics

Preamble: See document on page 2.

Competencies and Learning Outcomes:

1. An ability to demonstrate mathematical and quantitative reasoning.
    1.1 Perform the operations associated with sets, functions, and relations.
    1.2 Differentiate between independent and dependent events.
    1.3 Organize, display, and analyze data using graphs and descriptive statistics and use them to make decisions.
    1.4 Understand and apply concepts of probability.
    1.5 Algebraically use patterns, relations, functions, and coordinate geometry to analyze problem solving situations.
2. An ability to demonstrate core IT competency in computing and user support
    2.1 Identify the basic hardware and software components of an IT system, and explain their role and interactions.
    2.2 Taking into account design and usability considerations, implement hardware and software configurations, together with related troubleshooting strategies, to respond to a general scenario or a specific IT problem.
    2.3 Explain life-cycle strategies for replacing, reusing, recycling IT technology and resources.
    2.4 Explain the process that support computer networks and distributed computing.
    2.5 Identify the security risks such processes present and implement strategies to mitigate them.
3. An ability to demonstrate core IT competency in database and information management
    3.1 Identify database administration tasks.
    3.2 Diagram a relational database design based on an identified scenario.
    3.3 Produce database queries using SQL.
    3.4 Describe the data management activities associated with the data lifecycle.
    3.5 Discuss issues relevant to dealing with very large data sets, both structured and unstructured.
4. An ability to demonstrate core IT competency in networking and security
    4.1 Describe the layers, protocols, and components of the OSI and TCP models.
    4.2 Carry out basic network troubleshooting techniques.
    4.3 Differentiate among various techniques for securing a network.
    4.4 Diagram the components of internetworking e.g. switches, bridges, repeaters, routers, gateways.
    4.5 Differentiate among various networking models (e.g. circuit and packet switching concepts).
    4.6 Summarize the flow of data through a network scenario.

4.7 Describe wireless technologies and protocols.

4.8 Analyze ethical issues in security.

4.9 Define key terms and concepts in Information Security.

4.10   Identify and prioritize threats to inform assets.

4.11   Define risk management and risk control

4.12   Plan for and respond to intruders in an information system.

5. An ability to demonstrate core IT competency in programming and application development

5.1 Discuss software development methodologies.

5.2 Use an object-oriented programming or a scripting language to solve a problem.

5.3 Diagram the phases of the Secure Software Development Lifecycle.

5.4 Demonstrate best practices for designing user interfaces.

5.5 Demonstrate the techniques of defensive programming and secure coding.

5.6 Use a programming or a scripting language to share data across an integrated IT system.

5.7 Design, implement, test, and debug object-oriented programs involving the fundamental programming constructs, variables, expressions, assignments, I/O, control constructs, functions, parameter passing, and data structures.

5.8 Apply the techniques of decomposition to break a program into smaller pieces.

5.9 Create well-formed static and dynamic Web pages using current HTML, CSS, and JavaScript.

6. An ability to read, write, and interpret technical information

6.1 Use appropriate documentation or a knowledge base to find a solution to a problem.

6.2 Produce documentation to an information technology task that conforms to the requisite format and syntax appropriate to the audience.

6.3 Define terms and explain basic principles, concepts, and theories form another domain or discipline in which IT skills will be applied.

7. An ability to exhibit professionalism, ethical behavior, and good judgment on the impact of technology on society.

7.1 Apply communication, negotiation, and group decision-making abilities in team collaboration.

7.2 Discuss significant trends and emerging technologies and their impact on society.

7.3 Demonstrate professional behavior in response to an ethically-challenging scenario in computing.

7.4 Summarize the tenets of ethics and professional behavior promoted by international computing societies, such as ACM and AITP.

*Denotes co-chairs for this panel.

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2.17.2014

Pathway: Mechanical Engineering

Preamble: See document on page 2.

Executive Summary:

After May 15, 2015, a student who satisfactorily completes the requirements of an Associate degree at ITCC or VU and is successfully admitted into a baccalaureate ME program at an Indiana higher education institution will not be required to repeat the courses associated with the Statewide Mechanical Engineering Core requirements outlined in this SAP at the institution to which the student transfers. This SAP establishes a framework for the Statewide Mechanical Engineering Core, which includes two categories: "Engineering Foundational Principles" and "Engineering Design and Communications." Each category includes multiple competency areas.

The **Engineering Foundational Principles** category comprises competencies and learning outcomes that focus on both the fundamental engineering principles and the foundational mathematics necessary to apply these principles. The five key competencies include:

- Mathematics
- Mechanical Sciences
- Electrical Sciences
- Chemical/Thermal Sciences
- Computer Science

The second category, **Engineering Design Fundamentals and Communications**, comprises competencies and learning outcomes associated with the application of the foundational principles to both project design and communication (both oral and written). The two key competencies include:

- Design Fundamentals
- Communications

The statewide student competencies and learning outcomes for Mechanical Engineering are outlined below.

Competencies and Learning Outcomes:
Engineering Foundational Principles

1. Advanced Mathematics and Analytical Geometry
    1.1 Differential Calculus
        1.1.1 Use the limit process as a transition from pre-calculus mathematics to calculus
        1.1.2 Be familiar with classic problems that drove the development of differential and integral calculus.

1.1.3   Learn basic differentiation and integration rules.

1.1.4   Understand the importance of the Fundamental Theorem of Calculus.

1.1.5   Use calculus to solve real-life application problems for ME.

1.2 Integral Calculus

1.2.1   Represent information from a problem graphically, numerically, and analytically using functions, parametric equations, and polar equations.

1.2.2   Apply integration techniques to determine indefinite integrals.

1.2.3   Use integration to solve problems of area, volume, and arch length.

1.2.4   Solve problems involving infinity and/or indeterminate forms.

1.2.5   Analyze conics using graphs and equations.

1.2.6   Identify and apply appropriate tests to determine the convergence or divergence of infinite series.

1.3 Multivariate Calculus

1.3.1   Create power series expressions for functions, and determine their intervals of convergence by using one or more of a group of standard series and appropriate algebraic calculus manipulations.

1.3.2   Model 2-dimensional and 3-dimensional graphs with symmetric, parametric, and vector-valued equations, and describe and manipulate their geometric properties.

1.3.3   Use the calculus functions of 2 and 3 variables to locate and analyze the extreme values of surfaces in 3-dimensional space.

1.3.4   Model geometric problems of calculating area in 2 dimensions, and volume and surface area in 3 dimensions using double integrals.

1.3.5   Use the models to calculate numerical values.

1.3.6   Model curves in 3 dimensional space using vector-valued functions, and use the models to define and calculate geometric values along the curve, including arc length and curvature.

1.4 Linear Algebra – Ordinary Differential Equations

1.4.1   Analyze first-order differential equations.

1.4.2   Solve first-order and higher-order differential equations using a variety of techniques.

1.4.3   Understand numerical methods to solving ordinary differential equations.

1.4.4   Understand basic structures of linear algebra and their relationships to differential equations.

1.4.5   Appreciate applications of differential equations as mathematical models.

1.4.6   Work with Laplace transforms and their operational properties.

2. Physics and Mechanical Sciences
   2.1 Mechanics
      2.1.1 Demonstrate the ability to apply a unified approach to the basic principles of momentum, energy, angular momentum and thermodynamics to microscopic and/or macroscopic systems including hands-on laboratory applications and computer simulations.

   2.2 Statics
      2.2.1 Demonstrate the ability to apply Newton's Laws of Motion to systems in static equilibrium including general systems, trusses, frames and machines, and systems with friction.
      2.2.2 Demonstrate the ability to sketch shear-force and bending moment diagrams and perform "simple" stress calculations (pure axial, shear, torsional, and bending).

   2.3 Dynamics
      2.3.1 Demonstrate an ability to apply Newton's Laws of Motion to systems of particles, rigid body planar motion and systems experiencing 3-D motion with moving reference frames
      2.3.2 Demonstrate the ability to apply conservation principles (work-energy, linear-momentum, and angular impulse-momentum).
      2.3.3 Demonstrate an introductory knowledge of 2nd order linear mechanical systems.

3. Physics and Electromagnetic Sciences
   3.1 Electricity
      3.1.1 Solve problems involving Electric Fields and Electric Forces.
      3.1.2 Apply Gauss's law to derive the Electric Field resulting from spherical, cylindrical, planar, and linear charge distributions involving both dielectric materials and conducting materials.
      3.1.3 Solve problems dealing with resistors in direct current circuits. This includes series circuits, parallel circuits, and circuits to which Kirchoff's Laws are applied.
      3.1.4 Calculations include current, equivalent resistance, voltage power, and energy.

   3.2 Magnetism
      3.2.1 Solve problems dealing with the forces exerted on charges moving in magnetic fields.
      3.2.2 Solve problems and apply theories of sources of magnetic fields, including the Biot-Savart Law and Amperes Law.

    3.2.3   Solve problems dealing with induction, including Faraday's Law, Lenz's Law, self-induction, mutual-induction, and circuits containing inductance.

    3.2.4   Solve problems dealing with Alternating Current Circuits containing resistors, inductors, and capacitors.

    3.2.5   Solve problems dealing with electromagnetic wave theory.

3.3 Optics

    3.3.1   Solve geometrical optics problems dealing with refraction, reflection, lenses, and mirrors.

    3.3.2   Solve wave optics problems dealing with interference and polarization.

3.4 Circuit Analysis

    3.4.1   Define and explain the meaning/function of charge, current, voltage, power, energy, R, L, C, the o amp, the fundamental principles of Ohm's Law, KVL and KLC.

    3.4.2   Determine the equilibrium equations for a given network, and solve them using appropriate software as needed for the steady state (DC and AC/phasor) solution.

    3.4.3   Apply the principles of superposition, linearity, source transformations, and Thevenin/Norton equivalent circuits to analyze circuits and/or the determine responses.

    3.4.4   Predict (qualitatively) and calculate the step responses of first order (RL and RC) and second order (RLC) circuits.

    3.4.5   Calculate the steady state AC responses of basic circuits using the phasor method.

    3.4.6   Calculate effective and average values of periodic signals, and calculate the instantaneous and average power delivered to a circuit element.

    3.4.7   Calculate the complex power associated with a circuit element, and design a circuit to improve the power factor in AC circuit.

    3.4.8   Determine the conditions for maximum power transfer to any circuit element.

    3.4.9   Analyze resistive and RC op amp circuits.

    3.4.10 Design simple amplifiers using op amps.

4. Chemistry and Thermodynamics

   4.1 Chemistry

    4.1.1   Demonstrate a foundational knowledge of nuclear chemistry, polymers, inter-molecular forces/biochemical molecules, chemistry on an atomic scale, and simple inorganic solids. Laboratory experiences with these concepts are also essential.

4.2 Thermodynamics

    4.2.1   Demonstrate the ability to apply the 1st and 2nd Law of Thermodynamics to both open and closed systems, including select applications such as cycle analysis.

Engineering Design Fundamentals and Communications

5. Computer Science

    5.1 Programming Fundamentals

        5.1.1   Demonstrate competency in the principles, concepts, and methods of programming (C and MATLAB), with emphasis on developing solutions in the domains of the physical sciences, mathematics, and engineering.

        5.1.2   Demonstrate the ability to function as part of a technical team to generate the solution to a programming problem.

        5.1.3   Explore common programming concepts in various computing environments, and implement those concepts across more than one language.

        5.1.4   Analyze alternative algorithm designs to implement a solution designed to make efficient use of the limited resources of the computer.

6. Engineering Design Fundamentals

    6.1 Design Fundamentals

        6.1.1   Demonstrate an ability to apply a formalized design process, including problem definition, ideation, evaluation, and analysis,

        6.1.2   How to use common tools engineers use to make key design determinations.

        6.1.3   Recognize that design is inherently an iterative and reflective process.

    6.2 Teamwork

        6.2.1   Demonstrate an ability to work effectively in a team setting, including with others from different perspectives, gender, and cultures.

    6.3 Programming

        6.3.1   Demonstrate an ability to utilize computer tools like CAD/CAM, Excel, and MATLAB to catalog, analyze, and present data relevant to make critical design decisions.

    6.4 Written Communication

        6.4.1   Demonstrate an ability to write effective written reports (both short and long) that are layered (title, executive summary, main report, appendices, references) so the reader can easily go as deep or

shallow as required for their need, recognizing that the report needs to be designed for multiple audiences (peers, supervisors, management, company president, etc.)

6.5 Oral Communications

    6.5.1   Demonstrate an ability to clearly communicate an effective message on the process and results of the design process.

6.6 Ethics

    6.6.1   Demonstrate an understanding of the ethical dilemmas that engineers face and an awareness of the resources available when facing an ethical dilemma (e.g., Ethics Consultant's in the company, professional organizations like ASME, etc.)

7. Communications

  7.1 Written Communication Skills

    7.1.1   Produce texts that use appropriate formats, genres conventions, and documentation styles while controlling tone, syntax, grammar, and spelling.

    7.1.2   Demonstrate an understanding of writing as a social process that includes multiple drafts, collaboration, and reflection.

    7.1.3   Read critically, summarize, apply, analyze, and synthesize information and concepts in written and visual texts as the basis for developing original ideas and claims.

    7.1.4   Demonstrate an understanding of writing assignments as a series of tasks including identifying and evaluating useful and reliable outside resources.

    7.1.5   Develop, assert, and support a focused thesis with appropriate reasoning and adequate evidence.

    7.1.6   Compose texts that exhibit appropriate rhetorical choices, which include attention to audience, purpose, context, genre, and convention.

    7.1.7   Demonstrate proficiency in reading, evaluating, analyzing, and using material collected from electronic sources (such as visual, electronic, library databases, Internet sources, other official databases, federal government databases, reputable blogs, wikis, etc.)

  7.2 Oral Communications Skills

    7.2.1   Use appropriate organization or logical sequencing to deliver an oral message.

    7.2.2   Adapt and oral message for diverse audiences, contexts, and communication channels.

7.2.3   Identify and demonstrate appropriate oral and nonverbal communication practices.

7.2.4   Advance an oral argument using logical reasoning.

7.2.5   Provide credible and relevant evidence to support an oral argument.

7.2.6   Demonstrate the ethical responsibilities of sending and receiving oral messages.

7.2.7   Summarize or paraphrase an oral message to demonstrate comprehension.

7.3 Introduction to the Engineering Profession

7.3.1   Describe the engineering disciplines and the interrelationships among them.

7.3.2   Use a problem formulation and solving process to translate written problem statements into a mathematical model that allows for a logical comparison of approaches and tradeoffs in an engineering design.

7.3.3   Communicate technical information orally and visually.

7.3.4   Develop basic knowledge and introductory skills for cross-cultural communication.

7.3.5   Explain how an engineering problem solving process is related to design process.

7.3.6   Apply a design process to generate ideas, model, analyze, predict, and build an innovative object of engineering interest taking into consideration its societal and environmental impact.

7.3.7   Implement simple algorithmic solutions to engineering problems and in the design process using the most appropriate tool.

7.3.8   Demonstrate appropriate knowledge and behaviors for effective and ethical membership on a technical team (i.e., teaming skills).

7.3.9   Exhibit a work ethic appropriate for the engineering profession.

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1.30.2015

Pathway: Mechanical Engineering Technology

Preamble: See document on page 2.

Executive Summary:

After May 15, 2015, a student who satisfactorily completes the requirements of an Associate degree at ITCC or VU in MET and is successfully admitted into a baccalaureate MET program at an Indiana higher education institution will not be required to repeat the courses associated with the Statewide Mechanical Engineering Technology Core requirements outlined in this SAP at the institution to which the student transfers. This SAP establishes a framework for the Statewide Mechanical Engineering Technology Core is divided into seven competency areas. The seven key competencies include:

- Mathematics
- Physical Sciences
- Electrical Sciences
- Graphic Communications
- Technical Communications
- Materials and Processes

All outcomes and competencies must follow the guidelines of the accreditation body known as ETAC/ABET. These outcomes are listed as follows:

A. For associate degree programs, these student outcomes must include, but are not limited to, the following learned capabilities:

a. an ability to apply the knowledge, techniques, skills, and modern tools of the discipline to narrowly defined engineering technology activities;

b. an ability to apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require limited application of principles but extensive practical knowledge;

c. an ability to conduct standard tests and measurements, and to conduct, analyze, and interpret experiments;

d. an ability to function effectively as a member of a technical team;

e. an ability to identify, analyze, and solve narrowly defined engineering technology problems;

f. an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;

g. an understanding of the need for and an ability to engage in self-directed continuing professional development;

h. an understanding of and a commitment to address professional and ethical responsibilities, including a respect for diversity; and

i. a commitment to quality, timeliness, and continuous improvement.

Suggested competencies grouped by ETAC/ABET student outcomes:

ABET d. "an ability to function effectively as a member of a technical team;"

- Complete a narrowly defined technical project in a team of two or three students

ABET f. ". an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;"

- Present substantially error-free prose in narrative forms, laboratory and technical reports.
- Present technical explanations orally
- Locate, gather and organize information on an assigned technical topic
- Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions (DA10[i])

ABET g. "an understanding of the need for and an ability to engage in self-directed continuing professional development;"

- Identify opportunities to expand knowledge, skills, and abilities
- Recognize the need for, and have the ability to engage in independent updating in the context of specialized technical knowledge. (DA12[i])
- Undertake continuing professional development activities sufficient to maintain and extend his or her competence. (NC11[i])

ABET h. "an understanding of and a commitment to address professional and ethical responsibilities, including a respect for diversity;"

- Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well defined engineering problems. (DA6[i])
- Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts. (DA7[i])
- Understand and commit to professional ethics and responsibilities and norms of technician practice. (DA8[i])
- Recognize the reasonably foreseeable social, cultural and environmental effects of well-defined activities generally, and have regard to the need for sustainability; use engineering technical expertise to prevent dangers to the public. (NC6[i])
- Meet all legal and regulatory requirements and protect public health and safety in the course of his or her activities. (NC7[i])

ABET i. "a commitment to quality, timeliness, and continuous improvement."

- Meets deadlines

- Work presented with minimal errors
- Identify areas for improvement

References:

- "2014 - 2015 Criteria for Accrediting Engineering Technology Programs." Engineering Technology Accreditation Commission, ABET. http://abet.org/etac-criteria-2014-2015/
- "The Degree Qualifications Profile." Lumina Foundation. http://www.luminafoundation.org/publications/The_Degree_Qualifications_Profile.pdf
- "Graduate Attributes and Professional Competencies." by International Engineering Alliance http://www.ieagreements.org/IEA-Grad-Attr-Prof-Competencies.pdf

Competencies and Learning Outcomes:

1. Mathematics
    1.1 College Algebra
        1.1.1 Demonstrate the ability to simplify and perform operations on complex numbers, simplify rational expressions, simplify and perform operations on radicals, solve radical equations, solve quadratic and rational equations and inequalities, apply the concepts of ratio, proportion and combined variation, apply the properties of logarithms to solve exponential and logarithmic equations, solve polynomial equations and graph polynomial functions, graph exponential and logarithmic functions, graph rational functions, solve systems of equations with three variables, solve a variety of application problems in the above areas.
        1.1.2 Use a scientific and/or graphing calculator proficiently as related to coursework
        1.1.3 Use computer technology which may include the Internet, the Web, e-mail or computer tutorials to enhance course objectives.
    1.2 Trigonometry
        1.2.1 Convert between degree measure and radian measure, find trigonometric function values of any angle expressed in degree or radian measure, solve right triangles, solve oblique triangles using the laws of sine and cosine, use and apply properties of vectors, graph trigonometric functions, utilize trigonometric identities, solve trigonometric equations, convert between rectangular and polar coordinate systems, apply the properties of complex numbers in rectangular and polar forms, determine the features of a conic section from a standard equation, graph circles, parabolas, ellipses and hyperbolas
        1.2.2 Use the above principals to solve practical applications.

        1.2.3   Use a scientific/graphic calculator proficiently.

   1.3 Calculus for Technologists

        1.3.1   Differentiate single variable functions (including logarithmic and exponential functions) and apply differentiation techniques

        1.3.2   Students will know how to integrate single variable functions and use methods of integration.

2. Physical Sciences

   2.1 Physics (Mechanics)

        2.1.1   Apply basic principles of momentum, energy, angular momentum and thermodynamics to microscopic and/or macroscopic systems including hands-on laboratory applications and computer simulations.

   2.2 Statics

        2.2.1   Demonstrate the ability to apply Newton's Laws of Motion to systems in static equilibrium including general systems, trusses, frames and machines, and systems with friction.

        2.2.2   Demonstrate the ability to sketch shear-force and bending moment diagrams and perform "simple" stress calculations (pure axial, shear)

3. Electrical Sciences

   3.1 Electricity

        3.1.1   Solve problems involving Electrical Fields and Electric Forces.

        3.1.2   Apply Gauss's Law to derive the Electric Field resulting from spherical, cylindrical, planar, and linear charge distributions involving both dielectric materials

        3.1.3   Solve problems involving capacitors in circuits

        3.1.4   Solve problems dealing with resistors in direct current circuits

   3.2 Circuit Analysis

        3.2.1   Define and explain the meaning/function of charge, current, voltage, power, energy, R, L, C, the op amp, the fundamental principles of Ohm's Law, KVL and KLC.

        3.2.2   Perform DC analysis on a given circuit

        3.2.3   Calculate the steady state AC responses of basic circuits

        3.2.4   Calculate effective and average values of periodic signals

        3.2.5   Calculate the instantaneous and average power delivered to a circuit element

        3.2.6   Analyze resistive and RC op amp circuits, and design simple amplifiers using op amps.

4. Graphic Communication

   4.1 Drafting Theory and Principles

       4.1.1   Demonstrate a foundational knowledge of sketching practices, specific technical drawing communication topics, and the features and considerations associated with the operation of computer-aided design (CAD) systems

    4.2 Computer Aided Drafting and Design

       4.2.1   Apply drafting theory and principles with CAD software to create documentation necessary to convey information necessary for production using 2-D and 3-D software

    4.3 Industrial Standards

       4.3.1   Utilize common standards of Mechanical Engineering in design and documentation of products.

5. Technical Communication

    5.1 Written Communication

       5.1.1   Write effective layered reports (title, executive summary, main report, references, appendices)of appropriate length that are designed to meet the needs of multiple audiences

    5.2 Oral Communications

       5.2.1   Clearly communicate an effective technical message process

6. Technology Proficiencies

    6.1 Manufacturing Process

       6.1.1   Demonstrate knowledge and understanding of instrumentation, material removal processes, cold forming processes, hot working processes, joining processes, manufacturing processes

    6.2 Statistics

       6.2.1   Apply statistical methods.

       6.2.2   Emphasis shall be on data analysis of technological and industrial problems, introduction of design of experiments, basic probability, sampling distributions, confidence interval, significance tests for means and proportions, correlation, regression and Statistical Process Control.

    6.3 Fluid Power

       6.3.1   Calculate and demonstrate the basic physics of fluid mechanics using Pascal's Law

       6.3.2   Describe function and construction of various fluid power components including pumps, valves, cylinders, filters, pressure regulators, and accumulators

       6.3.3   Identify fluid power symbols and interpret fluid power schematic diagrams

       6.3.4   Demonstrate basic fluid power plumbing

       6.3.5   Design and draw elementary fluid power circuits

      6.3.6   Troubleshoot elementary fluid power circuits

      6.3.7   Calculate pressures in hydraulic systems using Bernoulli's Equation

      6.3.8   Demonstrate knowledge of safety procedures related to fluid power equipment

6.4 Material Sciences

      6.4.1   Demonstrate knowledge and understanding of physical and mechanical properties of solids, equipment and techniques for determining materials properties in the laboratory, phase diagrams, stress-strain diagrams, material property tests, failure testing, material property testing, and relationships between materials properties and algebraic/logarithmic design equations and concepts.

      6.4.2   Laboratory results in reports must include tabular and graphical data presentation

6.5 Industrial Automation and Controls

      6.5.1   Demonstrate competence in a broad range of modern industrial automation and controls technologies such as robotics, Programmable Logic Controllers, Industrial Controllers, motors and motor controllers, pneumatic controls, and analog and digital industrial sensors.

      6.5.2   Demonstrate competence in various forms of industrial automation programming methods such as structure language

      6.5.3   Application of software such as LabView®, or specific controller device programming of macros and scripts

      6.5.4   Describe applications of industrial control field devices including various types of electrical wiring, pushbuttons, switches, annunciators, terminations, motors, and Human Machine Interface devices

      6.5.5   Apply system integration concepts.

6.6 Quality

      6.6.1   Understand basic principles of quality control, statistical aspects of tolerances, basic concept of probabilities, frequency distribution, X and R charts and uses of mechanical, electronic, air, and light devices for checking and measuring to determine quality levels of acceptance

7. Professional Technical Skills

   7.1 Design Fundamentals

   7.1.1 Apply a formalized design process, including problem definition, ideation, evaluation, and analysis and use of common engineering design tools

   7.1.2 Recognize that design is and inherently iterative and reflective process

7.2 Teamwork

   7.2.1 Work effectively in a team including others with different perspectives, gender, and cultures

7.3 Ethics

   7.3.1 Demonstrate an understanding of the ethical dilemmas that engineers face and an awareness of the resources available when facing an ethical dilemma (e.g., Ethics Consultant's in the company, professional organizations like ASME, etc.)

7.4 Demonstrate a commitment to quality, timeliness, and continuous improvement.

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11.13.2014

Pathway: Nursing

Preamble: See document on page 2.

Executive Summary:

Associate and Baccalaureate Degrees granted from public institutions in the state of Indiana will meet the curricular standards published by the National Professional Organizations in nursing. Associate Degree Programs will meet the National League for Nursing (NLN) Competencies; Baccalaureate Degree Programs will meet the American Association of Colleges of Nursing (AACN, 2013), Essentials of Baccalaureate Nursing Practice ; and both degree programs will meet the Quality and Safety Education Network (QSEN) (Cronenwett, et. al., 2007) knowledge, skills, and attitudes.

Students in nursing programs in Indiana who wish to participate in the single articulation pathway must complete the general education core as a part of their coursework either at the ASN or BSN degree level. Students will complete any remaining general education requirements along with or prior to the upper division nursing courses necessary to complete the baccalaureate degree within the required time frame (4 years for a regularly progressing student) and 120 credit hours (unless the BSN program has received an exception).

Associate Degree Nursing Expected End of Program Competencies

NLN Competencies

1. Nursing Judgment

   Make judgments in practice, substantiated with evidence, that integrate nursing science in the provision of safe, quality care and that promote the health of patients within a family and community context.

2. Spirit of Inquiry

   Examine the evidence that underlies clinical nursing practice to challenge the status quo, question underlying assumptions, and offer new insights to improve the quality of care for patients, families, and communities.

3. Professional Identity

   Implement one's role as a nurse in ways that reflect integrity, responsibility, ethical practices, and an evolving identity as a nurse committee to evidence-based practice, caring, advocacy, and safe quality care for diverse patients within a family and community context.

4. Human Flourishing

   Advocate for patients and families in ways that promote their self-determination, integrity, and ongoing growth as human beings.

QSEN Competencies

5. Quality Improvement

    Use data to monitor the outcomes of care processes and use improvement methods to design and test changes to continuously improve the quality and safety of health care systems.

6. Safety

    Minimizes risk of harm to patients and providers through both system effectiveness and individual performance.

7. Evidence-based Practice

    Integrate best current evidence with clinical expertise and patient/family preferences and values for delivery of optimal health care.

8. Informatics

    Use information and technology to communicate, manage knowledge, mitigate error, and support decision making.

9. Teamwork and Collaboration

    Function effectively within nursing and inter-professional teams, fostering open communication, mutual respect, and shared decision-making to achieve quality patient care.

10. Patient-centered Care

    Recognize that the patient or designee as the source of control and full partner in providing compassionate and coordinated care based on respect for patient's preferences, values, and needs.

References

American Association of Colleges of Nursing. (2008). *The essentials of baccalaureate education*

   for professional nursing practice. Retrieved from: http://www.aacn.nche.edu/education-

   resources/BaccEssentials08.pdf

Cronenwett, L., Sherwood, G., Barnsteiner J., Disch, J., Johnson, J., Mitchell, P., Sullivan, D.,

   Warren, J. (2007). Quality and safety education for nurses. *Nursing Outlook*, 55(3)122-131.

National League for Nursing. (2012). *Outcomes and competencies for graduates*

   of practical/vocational, diploma, baccalaureate, master's, practice doctorate, and research doctorate

   programs in nursing. Retrieved from: http://www.nln.org/facultyprograms/competencies/comp_bacc.htm

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02.18.2015

Pathway: Social Work

Preamble: See Draft dated November 3, 2014

Executive Summary: <Insert>

Competencies and Learning Outcomes:

1. Identify as a professional social worker and conduct oneself accordingly.
    1.1 Students will identify multiple roles social workers perform
    1.2 Students demonstrate basic ability to use feedback for self-reflection and self-correction in improving their academic work.
    1.3 Students demonstrate effective interactions with others.
2. Apply social work ethical principles to guide professional practice.
    2.1 Students recognize the NASW Code of Ethics as the standard for social work practice
    2.2 Students are able to clarify personal values as they relate to professional values.
3. Apply critical thinking to inform and communicate professional judgments.
    3.1 Students demonstrate clarity, accuracy, precision, and relevance in communication.
4. Engage diversity and difference in practice.
    4.1 Recognize the influence of social structures on life chances.
    4.2 Gain sufficient self-awareness to decrease the influence of personal biases and values in working with diverse groups.
    4.3 Recognize and communicate their understanding of the importance of difference in shaping life experiences.
    4.4 View themselves as learners as they engage those with whom they work.
5. Advance human rights and social and economic injustice.
    5.1 Identify the forms and mechanisms of oppression and discrimination.
6. Engage in research-informed practice and practice-informed research
    6.1 Students will be able to differentiate between personal opinion and professional knowledge.
    6.2 Students are able to recognize the importance of professional literature and are able to locate and access material relevant to social work practice.
7. Apply knowledge of human behavior and the social environment.
    7.1 Describe theoretical frameworks in regard to human behavior.
8. Engage in policy practice to advance social and economic well-being and to deliver effective social work services.
    8.1 Demonstrate an understanding of the policy development process.
9. Respond to contexts that shape interactions.

Below is general guidance for all Transfer Single Articulation Pathways (TSAP). In some cases additional guidance may be needed for a specific pathway. That information is included with that pathway and not in this document.

1. Each Indiana state educational institution has agreed to student learning outcomes to be met while completing an associate's degree prior to transferring to an Indiana state 4-year university.

2. Ivy Tech Community College and Vincennes University will develop associate's degrees that include the Statewide Transfer General Education Core (30 credits) and courses that will result in mastery of the identified student outcomes for each single articulation pathway.

3. Each Indiana state 4-year institution will develop a 2-year program for completion of a bachelor's degree for a student who transfers with an associate's degree from a Transfer Single Articulation Pathway program. Students in a Transfer Single Articulation Pathway will be expected to meet the same expectations and requirements as students that start at the four-year institution.

4. In determining whether a student has completed the requirements of an associate's degree from a Transfer Single Articulation Pathway, each state educational institution will make this determination consistent with state law in relevant areas, such as applying credit for Advanced Placement scores and approved dual credit courses.

5. Only coursework resulting in Advanced Placement credit, dual credit, and credit from regionally accredited institutions may apply to an associate's degree within a Transfer Single Articulation Pathway. Institutions may accept other forms of credit according to their own existing policies, but these hours will not count towards the requirements of the Transfer Single Articulation Pathway.

6. A GPA of 2.0 meets the standard graduation requirement for associate degree and for the 30 hours of courses within the Statewide Transfer General Education Core which is included within the Transfer Single Articulation Pathway associate degree. However, a 2.0 GPA may not be enough to get you admitted into a 4-year institution or into the academic program of your choice.

7. Once a student has satisfactorily completed the requirements of a Transfer Single Articulation Pathway associate's degree at an Indiana state educational institution, the institution will validate and then document completion on the student's official transcript. If that student subsequently transfers to another Indiana state educational institution, the receiving institution will accept that documentation as satisfying the first two years of degree requirements if accepted into the institution and into the specific program. Furthermore, the receiving institution will apply 60 credit hours of transfer credit toward satisfying the transfer student's baccalaureate degree requirement. Students matriculating after May 1, 2015 are eligible for the Transfer Single Articulation Pathway program. Students who enrolled at 2-year institutions prior to May 1, 2015 may be eligible by meeting both of the following conditions: 1) changing their catalog year to Fall 2015 or later, 2) completion of at least 50% of the coursework for their degree after May 1, 2015.

8. Successful completion of a Transfer Single Articulation Pathway associate's degree is not a guarantee of admission to a particular state educational institution or a specific major. Further, acceptance into the 4-year institution does not guarantee acceptance into the baccalaureate pathway. Admission applications will provide an opportunity for students to indicate that they will be transferring with a completed Transfer Single Articulation Pathway associate's degree.

9. Students matriculating after May 1, 2015 are eligible for the Transfer Single Articulation Pathway program. Students who enrolled at 2-year institutions prior to May 1, 2015 may be eligible by meeting both of the following conditions: 1) changing their catalog year to Fall 2015 or later, 2) completion of at least 50% of the coursework for their degree after May 1, 2015.

10. If the associate's degree is not completed, transfer evaluation will occur using an institution's usual processes and standards on a course-by-course basis.

11. Working with an academic advisor is essential. In a few cases additional expectations may need to be met at a particular institution. Each student is responsible to review specific programs for admission requirements recognizing that many programs have competitive admission processes.

Transfer Single Articulation (TSAP) - FAQs

1. *What are Transfer Single Articulation Pathways (TSAPs)?*
   The TSAPs are competency-based tracks designed to promote seamless transfer from a 2-year to 4-year degree program. These were aligned with 13 program areas that have significant enrollment numbers by students who may first obtain an associate of science or an associate of arts degree. Completing the TSAP also completes the Statewide Transfer General Education Core (STGEC)
   https://secure.in.gov/che/files/STGEC_Guidance_13May22(1).pdf.

2. *Who do the TSAPs apply to?*
   TSAPs apply to all students matriculating at a public institution of higher education in Indiana in the fall of 2015 and after. Requirements change over time, and so the date at which the student firsts enter a school determines the requirements that apply. This is known as a catalog year or degree requirement term.

3. *What is satisfactory completion of the TSAP?*
   A minimum GPA of 2.0 is required for the associate degree and for the 30 hours of courses within the Statewide Transfer General Education Core (STGEC) which is included within the TSAP associate degree. Overall GPA requirements and specific course grade requirements may vary by discipline. However, a 2.0 GPA will probably not be enough to be admitted in a 4-year institution or into the academic program the student desires.

4. *Does satisfactorily completing the associate of science or associate of arts degree for the TSAP mean a student can transfer to any state educational institution?*
   No. Students must apply for admission as a transfer student, and identify that they have completed the TSAP, and apply to their program of study. Admission to a post-secondary institution does not guarantee admission into a student's program of study.

5. *What are the Competencies and Learning Outcomes for the TSAPs?*
   Competencies and Learning Outcomes are the skills and knowledge associated with the coursework considered foundational for further study in higher education, and which introduces students to a range of skills and disciplines. The Competencies and Learning Outcomes were agreed upon by faculty across state educational institutions.

6. *Do dual credit coursework and Advanced Placement (AP) examinations count towards the TSAPs requirements?*
   Yes. Dual credit from approved and regionally accredited providers and AP examinations count towards general education coursework in state education institutions and will be recognized as a part of the TSAPs.

7. *Can I count other kinds of coursework?*
Only coursework resulting in dual credit, AP credit, and credit from regionally accredited institutions may possibly apply to the TSAPs requirements students need to verify this with their advisor. Institutions may accept other forms of credit according to their own existing policies, but these hours will not count towards the requirements of the TSAPs.

8. *The school a student wants to transfer to has a residency requirement for its general education program. What is the impact?*
Students will not be adversely affected by this. Any residency requirement relating to general education will be waived for students who have satisfactorily completed the TSAPs at another Indiana state educational institution.

9. *What if the student wants to transfer before they have completed the TSAP?*
Coursework may still transfer, and all courses in the Indiana Core Transfer Library (CTL) must be articulated by state educational institutions. However, rather than receiving the block of 60 credit hours associated with the TSAP and an earned associate's degree, coursework will be articulated on a course-by-course basis by the institution to which the student transfers.

10. *How do I know that the TSAP has been completed?*
Each state educational institution will certify that you have met the TSAP requirements. Some institutions may award a certificate and all institutions will display it on the transcript. If the student is admitted as a transfer student to another state educational institution, that school must recognize the TSAP and apply 60 credit hours and the student's earned associate's degree to their record.

11. *Does the TSAP satisfy all general education requirements at the receiving campus?*
Not necessarily. While no state university can ask you to repeat coursework already met by the TSAP, some institutions may require additional general education coursework (i.e. different competencies, and more than 30 hours), and some degree programs require that specific coursework be completed for admission to a program or completion of degree objectives. Admission to a post-secondary institution does not guarantee admission into a student's program of study. ***Students should work closely with an advisor to ensure that they will meet as many program-specific requirements as possible as a part of their general education coursework and the TSAP.*** With a very few exceptions, baccalaureate degrees require 120 hours of coursework, of which the TSAP constitutes 60 hours.

12. *Does the TSAP affect other degree requirements?*
The TSAP does not change any requirements for a major or other degree objective. If any course within the TSAP is a requirement for a major or other degree objective at the

receiving institution, and students do not meet the grade requirement for that objective, then the receiving institution may require them to repeat the course. ***It is absolutely critical that students work closely with academic advisors to determine what relationship, if any, exists between requirements for general education and requirements for a specific major and/or other degree objective.***

13. *Does the TSAP apply to students studying at an independent (private) college or university in Indiana?*
No. Independent institutions in Indiana are not subject to SEA 182 (2013) and are, therefore, not participants in the TSAP.

14. *Is there a list of courses that are included in the TSAPs?*
No, there is a list of competencies. Each state educational institution has its own general education program. Some institutions may provide a list but the institutions are not required to do so. By following and satisfactorily completing this and, where relevant, any additional coursework specified for the TSAP, students will meet the requirements.

15. *What is the relationship between the CTL the TSAPs?*
The courses in the CTL have all been approved for transfer and articulation at Indiana state educational institutions. These are the most commonly taken and transferred courses, and many of them are courses that satisfy general education requirements. The most important thing to remember about the TSAP, though, is that it is met by following a specific pathway at any one state educational institution, and courses in the CTL represent just a fraction of those available at public institutions in Indiana.

<u>**CORE TRANSFER LIBRARY**</u> **-** P.L. 246 – 2005

IC 20-12-0.5-13

(a) The commission shall exercise its powers and duties under section 8 of this chapter in a manner to facilitate the use of: (1) the core transfer library established under section 8(18) of this chapter at state educational institutions; and (2) at least twelve (12) degree programs established under section 8 (19) of this chapter at Ivy Tech State College and Vincennes University.

(b) The core transfer library developed under section 8(18) of this chapter shall be developed in accordance with the following principles:

(1) Each course in the core transfer library must transfer in and apply toward meeting degree requirements in the same way as the receiving state educational institution's equivalent course.

(2) Courses in the core transfer library must draw primarily from the liberal arts but must include introductory or foundational courses in technical, professional, and occupational fields.

<u>**TRANSFER SINGLE ARTICULATION PATHWAYS**</u> **–** S.E.A. 182 (2013)

IC-21-42-6-4

(a) Each state educational institution, in collaboration with the commission for higher education, shall, not later than July 1, 2014, work together to create a single articulation pathway for each programmatic area specified in subsection (b)(2), and implement the single articulation pathways not later than May 15, 2015, for students entering state educational institutions in the fall of 2015.

(b) The state educational institutions, in collaboration with the commission for higher education, shall:

(1) determine the programmatic areas in which to develop single articulation pathways to degrees;

(2) develop single articulation pathways for programmatic areas in which significant numbers of students may first obtain an associate of science or an associate of arts degree with the intent of obtaining a related baccalaureate degree; and

(3) take into account emerging innovations in technology and practices implemented by the state educational institutions from which a student transfers.

(c) The single articulation pathways must:

(1) incorporate the statewide transfer general education core developed under IC 21-42-3-2;

(2) match complementary competencies and learning outcomes for both associate and baccalaureate degrees;

(3) allow a student who completes an associate degree for which a single articulation pathway has been developed to:

> (A) pursue a single, common curriculum in a particular programmatic area that will articulate, without alteration, with related baccalaureate degrees at all four (4) year state educational institutions that offer the baccalaureate degrees; and

> (B) apply all the credits earned for the student's associate degree toward the related baccalaureate degree so that the student may begin the baccalaureate degree as a junior status student; and

(4) be developed after consultation with employers regarding the competencies and learning outcomes considered especially important for successful careers and employment.

CTL Names in the Core Transfer Library: *Alphabetical*

- Abnormal Psychology
- Accounting 1
- Accounting 2
- Acting, Introduction to
- Algebra, College
- American Government
- American History 1
- American History 2
- American Literature 1
- American Literature 2
- Art Appreciation
- Art History 1
- Art History 2
- Astronomy, Introduction to
- Biology 1 w/lab, College*
- Biology 2 w/lab, College *
- Biology, Introduction to
- Business, Introduction to
- Calculus 1
- Calculus 2
- Calculus, Brief 1
- Calculus, Brief 2
- Calculus, Technical 1
- Calculus, Technical 2
- Chemistry 1 w/lab, General*
- Chemistry 2 w/lab, General*
- Chemistry, Survey of
- Children's Literature
- Creative Writing, Introduction to
- Criminal Justice, Introduction to
- Developmental Psychology
- Drawing
- Earth Science
- Economics, Introduction to
- English Composition 1
- English Composition 2
- Ethics
- Finite Mathematics
- First Aid
- French Level 1
- French Level 2
- French Level 3
- French Level 4
- German Level 1
- German Level 2
- German Level 3
- German Level 4
- Human Biology
- Human Nutrition
- Human Sexuality
- Interpersonal Communication
- Linguistics, Introduction to
- Literature, Appreciation of
- Macroeconomics
- Mass Communication, Introduction to
- Math Applications
- Medical Terminology
- Microbiology for the Health Sciences
- Microcomputers, Introduction to
- Microeconomics
- Music Appreciation
- Organic & Biochemistry w/lab
- Personal Finance
- Philosophy of Religion
- Philosophy, Introduction to
- Physical Geology
- Physical Science, Survey of
- Physics 1, Algebra-Based*
- Physics 1, Calculus-Based*
- Physics 2, Algebra-Based *
- Physics 2, Calculus-Based *
- Poetry, Introduction to
- Political Science, Introduction to
- Psychology, Introduction to
- Public Speaking, Fundamentals of
- Social Problems
- Social Psychology
- Sociology, Introduction to
- Spanish Level 1
- Spanish Level 2
- Spanish Level 3
- Spanish Level 4
- Technical Writing
- Theatre Appreciation
- Trigonometric Functions
- World Literature 1
- World Literature 2
- World Politics, Introduction to

*Level 1 and 2 courses, e.g. Algebra Based Physics 1 & 2, must be taken together to transfer.

TransferIN.net

Transferring credits, college to college

As of 05.15.15, there are 88 CTL Names.

CTL Names in the Core Transfer Library: *Category*

BUSINESS

- Accounting 1
- Accounting 2
- Business, Introduction to
- Economics, Introduction to
- Macroeconomics
- Microcomputers, Introduction to
- Microeconomics
- Personal Finance

COMMUNICATION/ENGLISH/ LITERATURE

- American Literature 1
- American Literature 2
- Children's Literature
- Creative Writing, Introduction to
- English Composition 1
- English Composition 2
- French Level 1
- French Level 2
- French Level 3
- French Level 4
- German Level 1
- German Level 2
- German Level 3
- German Level 4
- Interpersonal Communication
- Linguistics, Introduction to
- Literature, Appreciation of
- Mass Communication, Introduction to
- Poetry, Introduction to
- Public Speaking, Fundamentals of
- Spanish Level 1
- Spanish Level 2
- Spanish Level 3
- Spanish Level 4
- Technical Writing
- World Literature 1
- World Literature 2

HUMANITIES/FINE ARTS

- Acting, Introduction to
- Art Appreciation
- Art History 1
- Art History 2
- Drawing
- Ethics
- Music Appreciation
- Philosophy of Religion
- Philosophy, Introduction to
- Theatre Appreciation

LIFE AND PHYSICAL SCIENCES – NATURAL

- Astronomy, Introduction to
- Biology 1 w/lab, College*
- Biology 2 w/lab, College*
- Biology, Introduction to
- Chemistry 1 w/lab, General*
- Chemistry 2 w/lab, General*
- Chemistry, Survey of
- Earth Science
- First Aid
- Human Biology
- Human Nutrition
- Medical Terminology
- Microbiology for the Health Sciences
- Organic & Biochemistry w/lab
- Physical Geology
- Physical Science, Survey of
- Physics 1, Algebra-Based*
- Physics 1, Calculus-Based*
- Physics 2, Algebra-Based*
- Physics 2, Calculus-Based*

MATH

- Algebra, College
- Calculus 1
- Calculus 2
- Calculus, Brief 1
- Calculus, Brief 2
- Calculus, Technical 1
- Calculus, Technical 2
- Finite Mathematics
- Math Applications
- Trigonometric Functions

SOCIAL AND BEHAVIORAL SCIENCES

- Abnormal Psychology
- American Government
- American History 1
- American History 2
- Criminal Justice, Introduction to
- Developmental Psychology
- Human Sexuality
- Political Science, Introduction to
- Psychology, Introduction to
- Social Problems
- Social Psychology
- Sociology, Introduction to
- World Politics, Introduction to

*Level 1 and 2 courses, e.g. Algebra Based Physics 1 & 2, must be taken together to transfer.