Annex A1

COURSE DESCRIPTIONS AND LEARNING OBJECTIVES FOR:

Discrete Math
(Already in ACGM, course description has been revised, and learning outcomes have been added.)

Electrical Circuits I
(Already in ACGM, course description has been revised, and learning outcomes have been added.)

Electrical Circuits I Lab
(Brand New Course)

Engineering Economics
(Brand New Course)

Introduction to Digital Systems
(Brand New Course)

Introduction to Digital Systems Lab
(Brand New Course)

Linear Algebra
(Already in ACGM, course description has been revised, and learning outcomes have been added.)

Plane Surveying
(Already in ACGM, course description has been revised, and learning outcomes have been added.)

"C" Programming
(Already in ACGM, course description has been revised, and learning outcomes have been added.)

University Physics I
(Already in ACGM, course description and learning outcomes have been revised to include thermodynamics.)

University Physics I Laboratory
(No change needed, unless thermodynamics will be added…decision pending.)

Introduction to Engineering
(No Change Needed to ACGM.)

Fundamentals of Circuit Analysis ENGR 2307 and Fundamentals of Circuit Analysis Laboratory ENGR 2107 are proposed for deletion from the ACGM.

Already in ACGM, course description has been revised, and learning outcomes have been added.

Title: **TCCN:**	**Discrete Mathematics** **MATH 2305/2405**
Draft Course Description	A course designed to prepare math, computer science, and engineering majors for a background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science. Topics include: logic, relations, functions, basic set theory, countability and counting arguments, proof techniques, mathematical induction, combinatorics, discrete probability, recursion, sequence and recurrence, elementary number theory, graph theory, and mathematical proof techniques. Prerequisite: MATH 2313/2413/2513—Calculus I (with a grade of "C" or higher)
Draft Course Outcomes	Upon successful completion of this course, students will: 1. Construct mathematical arguments using logical connectives and quantifiers. 2. Verify the correctness of an argument using propositional and predicate logic and truth tables. 3. Demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability. 4. Solve problems involving recurrence relations and generating functions. 5. Use graphs and trees as tools to visualize and simplify situations. 6. Perform operations on discrete structures such as sets, functions, relations, and sequences. 7. Construct proofs using direct proof, proof by contraposition, proof by contradiction, proof by cases, and mathematical induction. 8. Apply algorithms and use definitions to solve problems to prove statements in elementary number theory.

Already in ACGM, course description has been revised, and learning outcomes have been added.

Title: **TCCN:**	**Electrical Circuits I** **ENGR 2305**
Draft Course Description	Principles of electrical circuits and systems. Basic circuit elements (resistance, inductance, mutual inductance, capacitance, independent and dependent controlled voltage, and current sources). Topology of electrical networks; Kirchhoff 's laws; node and mesh analysis; DC circuit analysis; operational amplifiers; transient and sinusoidal steady-state analysis; AC circuit analysis; first- and second-order circuits; Bode plots; and use of computer simulation software to solve circuit problems. Prerequisite or Co-requisite: MATH 2320—Differential Equations Prerequisites: PHYS 2325—University Physics I; PHYS 2125—University Physics I Laboratory; MATH 2414—Calculus II
Draft Course Outcomes	Upon successful completion of this course, students will: 1. Explain basic electrical concepts, including electric charge, current, electrical potential, electrical power, and energy 2. Apply concepts of electric network topology: nodes, branches, and loops to solve circuit problems, including the use of computer simulation. 3. Analyze circuits with ideal, independent, and controlled voltage and current sources. 4. Apply Kirchhoff's voltage and current laws to the analysis of electric circuits. 5. Explain the relationship of voltage and current in resistors, capacitors, inductors, and mutual inductors. 6. Derive and solve the governing differential equations for a time-domain first-order and second-order circuit, including singularity function source models. 7. Determine the Thevenin or Norton equivalent of a given network that may include passive devices, dependent sources, and independent sources in combination. 8. Analyze first and second order AC and DC circuits for steady-state and transient response in the time domain and frequency domain. 9. Derive relations for and calculate the gain and input impedance of a given operational amplifier circuit for both DC and frequency domain AC circuits using an ideal operational amplifier model. 10. Apply computer mathematical and simulation programs to solve circuit problems.

Note: Electric Circuits I and Electric Circuits I Laboratory can be taught as a single 4-SCH course.

Brand New Course

Title: **TCCN:**	**Electrical Circuits I Laboratory** **ENGR 2105**
Draft Course Description	Laboratory experiments supporting theoretical principles presented in ENGR 2305 involving DC and AC circuit theory, network theorems, time, and frequency domain circuit analysis. Introduction to principles and operation of basic laboratory equipment; laboratory report preparation. Co-requisite: ENGR 2305—Electrical Circuits I
Draft Course Outcomes	Upon successful completion of this course, students will: 1. Prepare laboratory reports that clearly communicate experimental information in a logical and scientific manner. 2. Conduct basic laboratory experiments involving electrical circuits using laboratory test equipment such as multimeters, power supplies, signal generators, and oscilloscopes. 3. Explain the concepts of Thévenin-equivalent circuits and linear superposition and apply them to laboratory measurements. 4. Predict and measure the transient and sinusoidal steady-state responses of simple RC and RLC circuits. 5. Predict the behavior and make measurements of simple operational-amplifier circuits. 6. Relate physical observations and measurements involving electrical circuits to theoretical principles. 7. Evaluate the accuracy of physical measurements and the potential sources of error in the measurements.

Note: Electric Circuits I and Electric Circuits I Laboratory can be taught as a single 4-SCH course.

Brand New Course

Title: **TCCN:**	**Engineering Economics** **ENGR 23##**
Draft Course Description	Methods used for determining the comparative financial desirability of engineering alternatives. Provides the student with the basic tools required to analyze engineering alternatives in terms of their worth and cost, an essential element of engineering practice. The student is introduced to the concept of the time value of money and the methodology of basic engineering economy techniques. The course will address some aspects of sustainability and will provide the student with the background to enable them to pass the Engineering Economy portion of the Fundamentals of Engineering exam. Prerequisites: MATH 2413—Calculus I Prerequisites or Co-requisites: ECON 2301—Principles of Macroeconomics or ECON 2302—Principles of Microeconomics
Draft Course Outcomes	Upon successful completion of this course, students will: 1. Apply different methods to calculate the time value of money. 2. Construct cash flow diagrams for a given problem. 3. Estimate total revenue, total cost, and break even points. 4. Calculate the uniform series payment, given principal, interest rate, and pay period. 5. Perform project evaluation, including cost/benefit analysis. 6. Articulate principles of taxation and depreciation. 7. Perform capital budgeting, cost comparisons, and replacement analyses. 8. Solve problems at a level consistent with expectations of the engineering economics portion of the Fundamentals of Engineering exam.

Brand New Course

Title: **TCCN:**	**Introduction to Digital Systems** **ENGR 2306**
Draft Course Description	Introduction to theory and design of digital logic, circuits, and systems. Number systems, operations and codes; logic gates; Boolean Algebra and logic simplification; Karnaugh maps; combinational logic; functions of combinational Logic; flip-flops and related devices; counters; shift registers; sequential logic; memory and storage. Co-requisite: ENGR 21XX—Introduction to Digital Systems Laboratory Prerequisite: MATH 1314–College Algebra or equivalent academic preparation
Draft Course Outcomes	Upon successful completion of this course, students will: 1. Utilize binary and hexadecimal numbers. 2. Solve problems involving digital codes, operations, and number systems. 3. Define, describe, and analyze fundamentals of Boolean algebra and digital logic gates. 4. Describe, analyze, design, and fabricate combinational logic circuits. 5. Describe, analyze, design, and fabricate sequential logic circuits. 6. Describe and explain the fundamentals of memory operations. 7. Apply computer mathematical and/or simulation tools to solve digital systems problems.

Note: Introduction to Digital Systems and Introduction to Digital Systems Laboratory can be taught as a single 4-SCH course.

Note: Some baccalaureate engineering programs will accept the course ENGR 23XX for transfer credit <u>and</u> as applicable to the engineering major, while others will accept the course for transfer credit only. The student is advised to check with the school to which he or she wants to transfer for specific applicability of this course to the engineering major.

Brand New Course

Title: **TCCN:**	**Introduction to Digital Systems Laboratory** **ENGR 2106**
Draft Course Description	Basic laboratory experiments supporting theoretical principles presented in ENGR 23XX involving design, construction, and analysis of combinational and sequential digital circuits and systems, including logic gates, adders, multiplexers, encoders, decoders, arithmetic logic units, latches, flip-flops, registers, and counters; preparation of laboratory reports. Co-requisite: ENGR 23XX—Introduction to Digital Systems
Draft Course Outcomes	Upon successful completion of this course, students will: 1. Prepare laboratory reports that clearly communicate experimental information in a logical and scientific manner. 2. Conduct basic laboratory experiments involving design and construction of digital circuits and systems. 3. Relate physical observations and measurements involving digital circuits and systems to theoretical principles. 4. Evaluate the accuracy of physical measurements and the potential sources of error in the measurements. 5. Design fundamental experiments involving principles of digital circuits and systems. 6. Identify and apply appropriate sources of information for conducting laboratory experiments involving digital circuits and systems. 7. Apply computer mathematical and/or simulation tools to solve digital systems problems.

Note: Introduction to Digital Systems and Introduction to Digital Systems Laboratory can be taught as a single 4-SCH course.

Note: Some baccalaureate engineering programs will accept the course ENGR 23XX for transfer credit <u>and</u> as applicable to the engineering major, while others will accept the course for transfer credit only. The student is advised to check with the school to which he or she wants to transfer for specific applicability of this course to the engineering major.

Already in ACGM, course description has been revised, and learning outcomes have been added.

Title: **TCCN:**	**Linear Algebra** **MATH 2318**
Draft Course Description	Introduces and provides models for application of the concepts of vector algebra. Topics include finite dimensional vector spaces and their geometric significance; representing and solving systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion; matrices; determinants; linear transformations; quadratic forms; eigenvalues and eigenvector; and applications in science and engineering. Pre-requisite: MATH 2414—Calculus II
Draft Course Outcomes	Upon successful completion of this course, students will: 1. Be able to solve systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion. 2. Be able to carry out matrix operations, including inverses and determinants. 3. Demonstrate understanding of the concepts of vector space and subspace. 4. Demonstrate understanding of linear independence, span, and basis. 5. Be able to determine eigenvalues and eigenvectors and solve problems involving eigenvalues. 6. Apply principles of matrix algebra to linear transformations. Demonstrate application of inner products and associated norms.

Already in ACGM, course description has been revised, and learning outcomes have been added.

Title: **TCCN:**	**Plane Surveying** **ENGR 1307**
Draft Course Description	Development of skills necessary to recognize and solve problems in surveying; introduction and use of various precision instruments used for surveying, including level, theodolites, electronic distance measuring equipment, and total stations for collecting field data; introduction of Global Positioning Systems (GPS) and Geographic Information Systems (GIS) and their use in surveying; and use of graphic design software, such as AutoCAD or Microstation, in surveying problems. Prerequisites: MATH 1316—Plane Trigonometry or equivalent, ENGR 1304—Engineering Graphics I
Draft Course Outcomes	Upon successful completion of this course, students will: 1. State the different classifications and types of surveys. 2. Apply principles of trigonometry to surveying problems. 3. Perform necessary unit conversions in surveying. 4. Demonstrate skills necessary for field work such as safety, note keeping, and instrument care. 5. Operate surveying equipment such as level, theodolite, total station, electronic distance measuring equipment, and surveying tape. 6. Determine the expected value and error bounds associated with measurements. 7. Perform horizontal and vertical measurements using standard surveying equipment for distance, angles, and contours. 8. Perform traverse and area calculations, including traverse closure. 9. Perform field layout for typical civil engineering applications such as highway geometrics and land development. 10. Present surveying data in graphical form using engineering design software such as AutoCAD or Microstation. Discuss the basic principles of GIS and GPS systems and their application to field surveying problems.

Already in ACGM, course description has been revised, and learning outcomes have been added.

Title: **TCCN:**	**"C" Programming** **COSC 1320**
Draft Course Description	Introduces the fundamental concepts of structured programming in the C language. Topics include data types; control structures; functions, structures, arrays, pointers, pointer arithmetic, unions, and files; the mechanics of running, testing, and debugging programs; introduction to programming; and introduction to the historical and social context of computing. Prerequisite: None
Draft Course Outcomes	Upon successful completion of this course, students will: 1. Analyze and explain the behavior of simple programs involving the fundamental programming constructs. 2. Modify and expand short programs that use standard conditional and iterative control structures and functions; choose appropriate conditional and iteration constructs for a given programming task. 3. 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, and the definition of functions. 4. Apply the techniques of structured (functional) decomposition to break a program into smaller pieces. 5. Describe the mechanics of parameter passing and demonstrate the difference between call-by-value and call-by-reference parameter passing. 6. Discuss the importance of algorithms in the problem-solving process, identify the necessary properties of good algorithms, and create algorithms for solving simple problems. 7. Use pseudocode or a programming language to implement, test, and debug algorithms for solving simple problems. 8. Discuss the representation and use of primitive data types and built-in data structures. 9. Explain the reasons for using different formats to represent numerical data. 10. Explain basic concepts of secure programming functions. 11. Discuss the properties of good software design. 12. Describe the phases of program translation from source code to executable code and the files produced by these phases; explain the software life cycle and its phases, including the deliverables that are produced. 13. Identify and describe the properties of a variable such as its associated address, value, scope, persistence, and size. 14. Explain how abstraction mechanisms support the creation of reusable software components.

Already in ACGM, course description and learning outcomes have been revised to include thermodynamics.

Title: **TCCN:**	**University Physics I** **PHYS 2325**
Course Description	Fundamental principles of physics, using calculus, for science, computer science, and engineering majors; the principles and applications of classical mechanics, including harmonic motion, physical systems, and thermodynamics; and emphasis on problem solving. Co-requisite: PHYS 2125—University Physics I Laboratory Prerequisite: MATH 2413—Calculus I
Course Outcomes	Upon successful completion of this course, students will: 1. Determine the components of linear motion (displacement, velocity, and acceleration), and especially motion under conditions of constant acceleration. 2. Solve problems involving forces and work. 3. Apply Newton's laws to physical problems. 4. Identify the different types of energy. 5. Solve problems using principles of conservation of energy. 6. Define the principles of impulse, momentum, and collisions. 7. Use principles of impulse and momentum to solve problems. 8. Determine the location of the center of mass and center of rotation for rigid bodies in motion. 9. Discuss rotational kinematics and dynamics and the relationship between linear and rotational motion. 10. Solve problems involving rotational and linear motion. 11. Define equilibrium, including the different types of equilibrium. 12. Discuss simple harmonic motion and its application to real-world problems. 13. Solve problems involving the First and Second Laws of Thermodynamics.

Note: University Physics I and University Physics I Laboratory can be taught as a single 4-SCH course.

No change needed, unless thermodynamics will be added…decision pending.

Title: **TCCN:**	**University Physics I Laboratory** **PHYS 2125**
Course Description	Basic laboratory experiments supporting theoretical principles presented in PHYS 2325 involving the principles and applications of classical mechanics, including harmonic motion, physical systems, experimental design, data collection and analysis, and preparation of laboratory reports. Co-requisite: PHYS 2325—University Physics I
Course Outcomes	Upon successful completion of this course, students will: 1. Prepare laboratory reports that clearly communicate experimental information in a logical and scientific manner. 2. Conduct basic laboratory experiments involving classical mechanics. 3. Relate physical observations and measurements involving classical mechanics to theoretical principles. 4. Evaluate the accuracy of physical measurements and the potential sources of error in the measurements. 5. Design fundamental experiments involving principles of classical mechanics. 6. Identify appropriate sources of information for conducting laboratory experiments involving classical mechanics.

Note: University Physics I and University Physics I Laboratory can be taught as a single 4-SCH course.

No change needed to ACGM.

Title: **TCCN:**	**Introduction to Engineering** **ENGR 1201**
Course Description	An introduction to the engineering profession with emphasis on technical communication and team-based engineering design. One hour of lecture and three hours of laboratory each week. Prerequisite: MATH 1314—College Algebra or equivalent academic preparation
Course Outcomes	Upon successful completion of this course, students will: 1. Describe the engineering profession and engineering ethics, including professional practice and licensure. 2. Use technical communication skills to explain the analysis and results of introductory laboratory exercises in engineering and computer science. 3. Explain the engineering analysis and design process. 4. Analyze data collected during laboratory exercises designed to expose students to the different engineering disciplines. 5. Describe the impact engineering has had on the modern world. 6. As part of a team, design a simple engineering device, write a design report, and present the design. 7. Demonstrate computer literacy.

Note: Some baccalaureate engineering programs will accept the course ENGR 1201 for transfer credit <u>and</u> as applicable to the engineering major, while others will accept the course for transfer credit only. The student is advised to check with the school to which he or she wants to transfer for specific applicability of this course to the engineering major.