# A Course Syllabi

This appendix contains recent syllabi for science, mathematics, and computer science courses. Note some syllabi were slightly altered in AY 2020-2021 due to restrictions from the global pandemic.

*Note that this page will be removed as it is replaced with the cover page (to match the formatting a little more.*

**Science Courses**



**Mathematics Courses**



**Computer Science Courses**



[1]The material in this course is now split into MA150 and MA153.
[2]The material in this course is now split into MA153 and MA154.

**Software Engineering Courses**



[3]The lab has now been merged into the lecture component.

**Computer Science and Software Engineering: Special Topics (300/375/399 designations)**



[4]Special topics can run a few times before they must be given a permanent designation per university policy

1. Course number and name
   **BIO 101, General Biology I**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Coordinator: Prof. Nancy Burns**

4. Text book, title, author, and year
   **Mastering Biology with Pearson, which includes: Urry LA, Cain ML, Wasserman SA, and Minorsky PV. 2020. Campbell Biology in Focus, 3rd edition. New York: Pearson**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course considers the basic concepts of life science with emphasis on the methods of science and the role of science in society, the chemistry of life, and molecular and cellular evolution. Selected topics include cellular biochemistry, the central dogma of biology, regulation of gene expression, cell structure and function, respiration and photosynthesis, and cell cycles. This course is primarily for students in health science programs or in the School of Engineering. First semester of a full-year course; must be taken in sequence.**

   b. prerequisites or co-requisites
      **Corequisites: BIO101L**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Objectives:**

      **The students will be introduced to the philosophy of science and the basic concepts of life sciences, in particular. The student will be encouraged to develop library and communication skills, familiarize him/herself with experimental design and the interpretation of biological data and build a foundation for advanced study in biology. In addition, the student will be encouraged to thoughtfully consider the ethical implications of scientific research.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **None listed in syllabus**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (06/27/21)

1. Course number and name
   **BIO 101L, General Biology I Lab**

2. Credits and contact hours
   **1**

3. Instructor's or course coordinator's name
   **Coordinator: Prof. Nancy Burns**

4. Text book, title, author, and year

   a. Other supplemental materials

5. Specific course information

   a. Catalog description of the content of the course
      **Lab to accompany BIO 101. Selected projects develop skills in experimental design, data analysis and scientific writing. (2 lab hrs.)**

   b. prerequisites or co-requisites
      **Corequisites: BIO101**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Learning Objectives (the student will be able to):**

      - **TBD**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **TBD**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised:

1. Course number and name
   **BIO 102, General Biology II**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Coordinator: Prof. Nancy Burns**

4. Text book, title, author, and year
   **Mastering Biology with Pearson, which includes: Audesirk T, Audesirk G, and Byers B. 2016. Biology: Life on Earth with Physiology, 11th edition. New York: Pearson**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course covers the basic concepts of life science with an emphasis on animal anatomy and physiology, animal reproduction and development, the nervous system, evolutionary mechanisms and ecological principles. Selected topics include microevolution, speciation, macroevolution, animal behavior and application of comparative anatomy and physiology to illuminate evolutionary relationships and their ecological context. This course is primarily for students in health science programs or in the School of Engineering. Second semester of a full-year course; must be taken in sequence.**

   b. prerequisites or co-requisites
      **Prerequisites: BIO101, BIO101L (Minimum Grade C-)**
      **Corequisites: BIO102L**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Objectives:**

      **The students will be introduced to the philosophy of science and the basic concepts of life sciences, in particular. The student will be encouraged to develop library and communication skills, familiarize him/herself with experimental design and the interpretation of biological data and build a foundation for advanced study in biology. In addition, the student will be encouraged to thoughtfully consider the ethical implications of scientific research.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **None listed in syllabus**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (06/27/21)

1. Course number and name
   **BIO 102L, General Biology II Lab**

2. Credits and contact hours
   **1**

3. Instructor's or course coordinator's name
   **Coordinator: Prof. Nancy Burns**

4. Text book, title, author, and year
   **Knisely, Karin. 2017. A Student Handbook for Writing in Biology, 5th Ed. Sunderland: Sinauer Associates, Inc.**
   **Smith, D.G. and Schenk, M.P. 2011. A Dissection Guide & Atlas to the Fetal Pig, third edition. Morton Publishing Company, Englewood, CO**

   a. Other supplemental materials
      **Dissection kit, Biology Goggles, SimBio Virtual Labs: Finches and Evolution, Laboratory manual (provided in Blackboard)**

5. Specific course information

   a. Catalog description of the content of the course
      **Lab to accompany BIO 102. Selected projects develop skills in experimental design, data analysis and scientific writing. (2 lab hrs.)**

   b. prerequisites or co-requisites
      **Prerequisites: BIO101, BIO101L (Minimum Grade C-)**
      **Corequisites: BIO102**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **None listed in syllabus (See BIO102 syllabus)**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Laboratory Units**

   - **Syllabus, Course Policies, Lab Safety**
   - **Invertebrates**
   - **Vertebrate Anatomy**
   - **Nervous System**
   - **ELISA**
   - **Ecology**
   - **Evolution**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (06/27/2021)

1. Course number and name
   **BIO150, General Biology for Majors**

2. Credits and contact hours
   **4**

3. Instructor's or course coordinator's name
   **Coordinator: Prof. Nancy Burns**

4. Text book, title, author, and year

   - ***A Student Handbook for Writing in Biology, 5th Edition*, Knisely, Karin, 2017.**
   - ***Mastering Biology Online Study System, 12th Edition* (ISBN 9780135855836), Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., Orr, R. B., Campbell, N.A, 2020.**

   a. Other supplemental materials
      **None.**

5. Specific course information

   a. Catalog description of the content of the course
      **Students develop sound learning strategies and introductory knowledge within five core concepts in biology: science as a way of knowing, chemistry of life, structure and function relationships; major pathways and transformations of energy and matter, as well as living systems as interactive and interconnected. This is the first course of a three-course sequence for biology and related majors.**

   b. prerequisites or co-requisites
      **Corequisites: BIO150L**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Outcomes are given as a list of topics (see below).**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Science as a Way of Knowing: To help students to understand major epistemological considerations, e.g., How is science different from other kinds of inquiry, e.g., like faith or other philosophical disciplines? What is the Criterion of Demarcation? What is a hypothesis? What distinguishes treatments and controls? What does the asymmetry of proof and disproof refer to and why is this issue important to understanding what scientific theories are. What are the three hallmarks of a scientific investigation?**
   - **Atoms, Bonds and Molecules: Why do atoms interact and form bonds? What kinds of bonds are common in biological systems and what characteristics do they have?**

- **Macromolecules: their Chemistry and Biology: What are the four major kinds of organic molecules, their structural features, and functional roles in biological systems? What kinds of bonds are critical to the functioning of each kind of macromolecule? What are the structural features of nucleic acids and proteins that enable reproduction, information storage, mutation, and catalysis?**
- **Energy, Enzymes and Catalysis: What is catalysis and how is it regulated in biological systems? What are the structural features of biological catalysts that enable them to work with lock-and-key specificity? What are the typical energetics of a catalyzed reaction? What ultimately determines the timing and structure of the various catalysts?**
- **Prokaryotes and Eukaryotes: What are the structural and functional differences between prokaryotes and eukaryotes?**
- **Cell Communication: How do membranes work? How is transport across membranes regulated? What are the components of the endomembrane system and how do they interact? How did the double membranes of the nucleus, mitochondria, and chloroplasts originate - what are the contending hypotheses and evidence?**
- **Respiration and Photosynthesis: How is energy captured and converted to various chemical forms in photosynthesis and respiration? How do photosynthesis and respiration work as biochemical systems, including major inputs and outputs? What is chemiosmosis and how does it function, in both photosynthesis and respiration, and how are membranes and their proteins involved in this work?**
- **Anatomy and Physiology: How are vertebrate systems organized? What are the major organs in a vertebrate system? How do these major organs function for homeostasis? What are the cellular components that control the function of cells, tissues and organs in an organ system?**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised:

1. Course number and name
   **BIO150L, General Biology for Majors Lab**
2. Credits and contact hours
   **0**
3. Instructor's or course coordinator's name
   **Coordinator: Prof. Nancy Burns**
4. Text book, title, author, and year
   ***A Student Handbook for Writing in Biology, 5th Edition*, Knisely, Karin, 2017.**
   a. Other supplemental materials
      ***BIO 150L General Biology Lab Manual* and Biology (or Chemistry) Googles (all available at the University Bookstore)**
5. Specific course information
   a. Catalog description of the content of the course
      **Lab to accompany BIO 150. Students take an investigative/inquiry-based approach and become competent within the process of science including experimental design and analysis, as well as scientific communication and collaboration.**
   b. prerequisites or co-requisites
      **Corequisites: BIO150**
   c. indicate whether a required, elective, or selected elective
      **Selected elective**
6. Specific goals for the course
   (a) specific outcomes of instruction
      **Learning Objectives (the student will be able to):**
      - **Learn basic laboratory and microscope skills**
      - **Assume leadership and responsibility for designing, executing, analyzing and reporting scientifically sound experiments**
      - **Learning to write and present in scientific format**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**
7. Brief list of topics to be covered
   **Lab Topics**
   - **Scientific Method**
   - **Scientific Writing/Plagiarism**
   - **Biological Molecules**
   - **Enzymes**
   - **Microscopy**
   - **Osmosis**
   - **Cellular Respiration**
   - **Anatomy**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised:

1. Course number and name
   **BIO151, Molecular and Cell Biology and Genetics**

2. Credits and contact hours
   **4**

3. Instructor's or course coordinator's name
   **Coordinator: Prof. Nancy Burns**

4. Text book, title, author, and year

   - ***A Student Handbook for Writing in Biology, 5th Edition*, Knisely, Karin, 2017.**
   - ***Mastering Biology Online Study System, 12th Edition* (ISBN 9780135855836), Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., Orr, R. B., Campbell, N.A, 2020.**

   a. Other supplemental materials
      **None.**

5. Specific course information

   a. Catalog description of the content of the course
      **Students investigate key concepts in molecular and cell biology and genetics. Topics include evolution, the central dogma, regulation of gene expression, cell structure and physiology, cell communication, immunology, cancer and cell division.**

   b. prerequisites or co-requisites
      **Prerequisites: BIO150, BIO150L (Minimum Grade C-)**
      **Corequisites: BIO151L**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Learning Objectives (the student will be able to): Outcomes are given as a list of topics (see below).**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Gene Expression. How do the molecular structures of DNA, RNA, and protein enable expression of the same information in the three different kinds of molecules? What is the genetic code and how was it elucidated? What are the roles of ribosomes, tRNA, rRNA, and mRNA in protein synthesis? What major kinds of regulation of gene expression are exhibited in prokaryotes? How is this system more complicated in the multicellular eukaryotic descendants of prokaryotes?**
   - **Cell Communication. How do cells receive and interpret information from their surrounding environment? How do cells communicate with one another? What are the major signaling pathways in eukaryotic cells and how do they influence cell behavior? What are the apoptotic pathways and what signals trigger them? What is the cell cycle? How do cyclin and cyclin-dependent kinases influence cell cycles? How does loss of cell cycle control lead to cancer?**

- **Genetics. What are the fundamental processes of meiosis? How are the traits of parents transmitted to their offspring? How is genetic variation produced and the evolutionary importance of this variation? What two laws of inheritance did Gregor Mendel discover using a scientific approach? What is the importance of Morgan's discovery and how does it apply to patterns of inheritance? How do alterations of chromosome number or structure result in a genetic disorder? What are non-Mendelian patterns of inheritance?**
- **Evolution. What is the central dogma of biology and how does it relate to the biological capabilities of the hereditary molecule, to the very existence and nature of evolution? What are viruses and how do they replicate? What are the key concepts of Darwin's Theory of evolution? What is the biological species concept? How does natural selection influence adaptive evolution? What roles do genetic drift and gene flow have in natural selection? How has life evolved?**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised:

1. Course number and name
   **BIO151L, Molecular and Cell Biology and Genetics Lab**

2. Credits and contact hours
   **0**

3. Instructor's or course coordinator's name
   **Coordinator: Prof. Nancy Burns**

4. Text book, title, author, and year
   ***A Student Handbook for Writing in Biology, 5th Edition*, Knisely, Karin, 2017.**

   a. Other supplemental materials
      ***BIO 151L General Biology Lab Manual* and Biology (or Chemistry) Googles (all available at the University Bookstore) and Basic Calculators**

5. Specific course information

   a. Catalog description of the content of the course
      **Selected projects enable students to develop skills in experimental design through an investigative/inquiry-based approach, data analysis and scientific writing.**

   b. prerequisites or co-requisites
      **Prerequisites: BIO150, BIO150L (Minimum Grade C-)**
      **Corequisites: BIO151**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Not specified. See Topic list and Course Description.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **DNA Fingerprinting**
   - **Gene Expression**
   - **Scientific Writing**
   - **Cell Signaling**
   - **Cell Communication**
   - **Evolution**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised:

1. Course number and name
   **CHE 110, General Chemistry I**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Dr. James F. Kirby, Ph. D.**

4. Text book, title, author, and year
   **General Chemistry by D. Ebbing & S. Gammon, 11th ed., Cengage Learning, 2017.**

   a. Other supplemental materials
      **Cengage Unlimited, OWLv2, Calculator supporting logarithmic functions**

5. Specific course information

   a. Catalog description of the content of the course
      **Students study the atomic theory of matter, nomenclature, chemical formulas and reaction equations, stoichiometry, the gas laws and the kinetic molecular theory, thermochemistry, atomic structure, periodicity of the elements, chemical bonding and molecular structure. (Note: this course is designed for science majors.)**

   b. prerequisites or co-requisites
      **A math placement score of 3 or higher (or suitable math course) is required to enroll in CHE110. Corequisites: CHE110L**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Outcomes are given as a list of fundamental principles and concepts (see below).**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Fundamental Principles and Concepts**

   - **Physical and chemical properties of matter**
   - **S.I. units and their application in dimensional analysis**
   - **Density**
   - **Proper use of significant figures**
   - **Structure of the atom, atomic number, atomic mass and isotopes**
   - **Significance of the periodic table and its use to predict the formation of molecules and compounds**
   - **Chemical formulas of compounds and how they are named**
   - **Mass relationships in chemical reactions and the Law of Conservation of Matter**
   - **Balance chemical equations and use them to calculate the amount of product formed from a given amount of reactants (stoichiometry)**
   - **Solution behavior of electrolytes and non-electrolytes**

- **Chemical reactions in aqueous solutions including acid-base reactions, oxidation and reduction reactions and precipitation reactions**
- **Express the concentration of a solution using molarity and dilute a solution to obtain a desired concentration**
- **Gas behavior based on the Kinetic Molecular Model**
- **Thermochemistry and the Law of Conservation of Energy as applied to chemical systems**
- **Energy changes in chemical reactions**
- **Quantum theory and the electronic structure of the atom**
- **Electron configuration and the Aufbau Principle**
- **Periodic classification of the elements and periodic variation in their physical properties**
- **Basic concepts of chemical bonding in both ionic compounds and covalent molecules**
- **Lewis structures and molecular geometries and polarities of molecules based on application of the VSEPR model**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (6/27/2021)

1. Course number and name
   **CHE 110L, General Chemistry I Lab**

2. Credits and contact hours
   **1**

3. Instructor's or course coordinator's name
   **Lab Coordinator: Dr. Jennifer Cruz**

4. Text book, title, author, and year
   **Laboratory manual for the course (available from the campus bookstore)**

   a. Other supplemental materials
      **Approved safety goggles, approved clothing (see Laboratory Safety Rules), approved lab notebook capable of carbon-copying, pen, calculator**

5. Specific course information

   a. Catalog description of the content of the course
      **Lab must be taken with CHE 110. (3 lab hrs.)**

   b. prerequisites or co-requisites
      **Corequisites: CHE110**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **None Listed (See CHE110)**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lab Experiments**

   - **Measurement and Introduction to Lab Equipment**
   - **Separation Methods**
   - **Determination of the Formula of a Metal Oxide**
   - **The Determination of Salt Solutions by Density**
   - **Precipitation Reactions and the Synthesis of Chalk**
   - **Determining the Molar Mass of an Unknown Acid by Titration**
   - **Antacid Effectiveness by Back Titration**
   - **Gas Law Experiment: Determination of the Molar Mass of a Volatile Liquid**
   - **Using Calorimetry to Determine Specific Heat and Heat of Solution**
   - **Enthalpy of Decomposition of Hydrogen Peroxide**
   - **Spectrophotometric Determination of Blue Dye #1 in Consumer Samples**
   - **Molecular Structures and Shapes**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (6/27/2021)

1. Course number and name
   **CHE 111, General Chemistry II**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Frank Tagliaferro**

4. Text book, title, author, and year
   **General Chemistry by D. Ebbing & S. Gammon, 11th ed., Cengage Learning, 2017**

   a. Other supplemental materials
      **Cengage Unlimited, OWLv2, Calculator supporting logarithmic functions**

5. Specific course information

   a. Catalog description of the content of the course
      **Students study intermolecular forces, properties of solutions, kinetics, chemical equilibrium, pH, acid-base solution chemistry, thermodynamics and electrochemistry. Problem-solving is emphasized.**

   b. prerequisites or co-requisites
      **Prerequisites: CHE110, CHE110L (Minimum Grade C-)**
      **Corequisites: CHE111L**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Outcomes are given as a list of fundamental principles and concepts (see below).**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Fundamental Principles and Concepts**

   - **Understand the role of intermolecular forces in the physical properties of liquids and solids**
   - **Demonstrate a basic knowledge of crystal structure and the impact of intermolecular forces on physical properties**
   - **Understand phase changes and develop the ability to interpret phase diagrams**
   - **Calculate the concentration of solutions using molarity, molality, and**
   - **Understand the effect of temperature and pressure on solubility**
   - **Determine the melting point, freezing point, vapor pressure and osmotic pressure of solutions using colligative properties for solutions composed of non-electrolytes and electrolytes**
   - **Determine the rate law and reaction rate of a chemical system**
   - **Understand activation energy and how temperature affects the rate of a reaction**
   - **Understand reaction mechanisms and the role of catalysts in the rate of a reaction**

- **Understand and apply the principles of equilibrium to chemical systems**
- **Calculate concentrations of products or reactants using the equilibrium expression and equilibrium constants**
- **Apply Le Chatelier's Principle to chemical systems**
- **Determine the pH of acids, bases, buffers and salt solutions**
- **Understand and apply the Laws of Thermodynamics**
- **Predict whether a chemical reaction will occur spontaneously**
- **Balance oxidation-reduction reactions**
- **Determine the electrical potential of an oxidation-reduction reaction**
- **Understand and use the Nernst Equation to calculate free energy, equilibrium constants and electrical potential of systems that are not at standard conditions**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (6/27/2021)

1. Course number and name
   **CHE 111L, General Chemistry II Lab**

2. Credits and contact hours
   **1**

3. Instructor's or course coordinator's name
   **Lab Coordinator: Dr. Robert Grosso**

4. Text book, title, author, and year
   **Laboratory manual for the course (available from the campus bookstore)**

   a. Other supplemental materials
      **Approved safety goggles, approved clothing (see Laboratory Safety Rules), approved lab notebook capable of carbon-copying, pen, calculator**

5. Specific course information

   a. Catalog description of the content of the course
      **Lab must be taken with CHE 111. (3 lab hrs.)**

   b. prerequisites or co-requisites
      **Prerequisites: CHE110, CHE110L (Minimum Grade C-)**
      **Corequisites: CHE111**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **None Listed (See CHE111)**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lab Experiments**

   - **Safety and Introduction**
   - **Evaporation and Intermolecular Forces**
   - **Conductivity of Solutions: The Effect of Concentration**
   - **Effect of Temperature on Solubility**
   - **Molar Mass by Freezing Point Depression**
   - **Chemical Kinetics of Hydrogen Peroxide Decomposition**
   - **Dissolution Kinetics of Solids**
   - **Determination of the Acid Ionization Constant**
   - **Buffers**
   - **Determination of the Solubility Product Constant of Calcium Hydroxide**
   - **Entropy, Gibbs Free Energy, and Reaction Quotient**
   - **Vitamin C Analysis by Oxidation-Reduction Titration**
   - **Cell Potentials and Electrochemistry**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (6/27/2021)

1. Course number and name
   **PHY 121, University Physics I**

2. Credits and contact hours
   **4**

3. Instructor's or course coordinator's name
   **Prof. Robert Fischetti**

4. Text book, title, author, and year
   **Modified Mastering Physics with Pearson eText (Standalone Access Card) for University Physics with Modern Physics**

   a. Other supplemental materials
      **Pen/pencil, notebook, calculator, laptop**

5. Specific course information

   a. Catalog description of the content of the course
      **This is a calculus-based physics course. Students examine classical Newtonian physics from kinematics, the study of motion, to dynamics, the study of why motion occurs. Topics include Newton's laws, conservation of energy and momentum, torque, equilibrium of static bodies and fluids, and thermal properties of matter. Through experimentation, computer modeling and group problem-solving, students apply these principles to predict the outcome of a number of reality-based and open-ended problems. (6 studio-lab hrs.)**

   b. prerequisites or co-requisites
      **Prerequisites: MA141 or MA151 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **See course description (no specific goals/outcomes)**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Course Topics**

   - **Units, quantities and vectors**
   - **Motion along a straight line**
   - **Motion in two or three dimensions**
   - **Newton's Laws of Motion**
   - **Applying Newton's Laws of Motion**
   - **Work and kinetic energy**
   - **Potential energy and energy conservation**
   - **Momentum, impulse and collisions**
   - **Rotation of Rigid bodies**
   - **Dynamics of rotational motion**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (6/27/2021)

1. Course number and name
   **PHY 122, University Physics II**

2. Credits and contact hours
   **4**

3. Instructor's or course coordinator's name
   **Prof. Douglas S. Goodman**

4. Text book, title, author, and year
   **Modified Mastering Physics with Pearson eText (Standalone Access Card) for University Physics with Modern Physics**

   a. Other supplemental materials
      **Pen/pencil, notebook, calculator, laptop**

5. Specific course information

   a. Catalog description of the content of the course
      **This is a calculus-based physics course. Students examine physical phenomena including vibrations and waves, sound, light, optics, electricity and magnetism including the study of D.C. and A.C. circuits and some elements of modern physics. Through experimentation, computer modeling and group problem-solving, students apply these principles to predict the outcome of a number of reality-based and open-ended problems. (6 studio-lab hrs.)**

   b. prerequisites or co-requisites
      **Prerequisites: PHY121 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **See course description (no specific goals/outcomes)**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Vectors**
   - ***e/m* Ratio**
   - **DC Motor**
   - **PhET: E-field**
   - **Faraday Cage**
   - **PhET: Voltage**
   - **Circuits**
   - **Helmholtz Coil**
   - **Induction**
   - **Traveling Wave**

- **Polarization**
- **Standing Waves**
- **Photons**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (6/27/2021)

1. Course number and name
   **MA141, Calculus of a Single Variable I**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Varied**

4. Text book, title, author, and year
   ***Single Variable Calculus, Early Transcendentals*** **(with WebAssign), James Stewart**

   a. Other supplemental materials
      **Calculator: TI-83 or TI-84 (TI-89 and Nspires are not allowed)**

5. Specific course information

   a. Catalog description of the content of the course
      **This course covers functions, graphs, limits, continuity, derivatives, applications of derivatives, antiderivatives and definite integrals, as well as the Fundamental Theorem of Calculus. This course significantly advances the following Essential Learning Outcomes: quantitative reasoning, critical thinking and reasoning. Many sections require a TI-83/84 calculator (or the equivalent); check with the instructor. Students cannot receive credit for both MA 141 and MA 151.**

   b. prerequisites or co-requisites
      **Prerequisites: MA140 (Minimum Grade C-) or score of 5 on Math Placement**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Not specified.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Functions**
   - **Essential functions and operations**
   - **Exponential and Logarithmic Functions**
   - **The limit of a function**
   - **Limit laws and continuity**
   - **Limits at infinity**
   - **Derivatives and Rates of Change**
   - **The Derivative as a function**
   - **Derivative Rules**
   - **Product and Quotient Rule**
   - **Derivative of the Trigonometric Functions**

- **The Chain Rule**
- **Implicit Differentiation**
- **Derivative of the Logarithmic Functions**
- **Max and min values; How derivatives shape Graphs**
- **Optimization**
- **Related Rates**
- **Anti-derivatives**
- **Sigma Notation**
- **Areas and Distances**
- **The Definite Integral**
- **The Fundamental Theorem of Calculus**
- **Indefinite Integrals**
- **The Substitution Rule**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA150, Integral Calculus With Applications**

2. Credits and contact hours
   **1**

3. Instructor's or course coordinator's name
   **Cornelius Nelan**

4. Text book, title, author, and year
   ***Calculus, 8th edition*, James Stewart, 2015**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **his course provides a bridge from MA 141 to MA 152 or MA 153. Students review basic integration rules, integration by substitution, The Fundamental Theorem of Calculus, numerical integration and applications of integration, including area between curves, volumes, arc length and applications from physics. A graphing calculator is required; the TI-83 or TI-84 is recommended.**

   b. prerequisites or co-requisites
      **Prerequisites: MA141 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**

      **1. Develop an appreciation of the power of calculus as a tool for modeling reality.**

      **2. Develop geometric intuition and deductive skill.**

      **3. Appreciate the concept of integration and its various applications**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Integrals and Antiderivatives: u substitution**
   - **Areas and integrals**
   - **Fundamental Theorem of Calculus**
   - **Approximating Sums**
   - **Integral as a limit**
   - **Interpretations and applications**
   - **Volumes**
   - **Work**

- **Average Value**
- **Arc Length**
- **Surface Area**
- **Engineering Applications**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA151, Calculus I**

2. Credits and contact hours
   **4**

3. Instructor's or course coordinator's name
   **Lisa Hollman**

4. Text book, title, author, and year
   ***Single Variable Calculus - Early Transcendentals, 9th edition*, James Stewart, Daniel Clegg, and Saleem Watson, 2020**

   a. Other supplemental materials
      **A graphing calculator (TI-83 or TI-84 recommended)**

5. Specific course information

   a. Catalog description of the content of the course
      **This course covers functions and graphs, limits and continuity, derivatives, applications of derivatives, antiderivatives and definite integrals, the Fundamental Theorem of Calculus, numerical integration and applications of definite integrals. A graphing calculator is required; the TI-83 or TI-84 is recommended. Students cannot receive credit for both MA 151 and MA 141.**

   b. prerequisites or co-requisites
      **Prerequisites: MA140 (Minimum Grade of C-) or score of 5 on Math Placement Exam**

   c. indicate whether a required, elective, or selected elective
      **Required (as an alternate to MA141)**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**

      1. **Evaluate limits, derivatives, and basic integrals.**
      2. **Use derivatives to solve several varieties of problems.**
      3. **Understand the meaning of the derivative in terms of rate of change.**
      4. **Understand the meaning of the derivative as a limit.**
      5. **Understand the meaning of the definite integral in terms of a limit.**
      6. **Understand the meaning of the definite integral in terms of area.**
      7. **Understand the relationship between the derivative and the definite integral as expressed in the Funda- mental Theorem of Calculus.**
      8. **Calculate elementary integrals.**
      9. **Relate calculus concepts to the graphical, numerical, and symbolic representations of functions.**
      10. **Solve a wide variety of problems from physics, engineering, and mathematics.**
      11. **Appreciate calculus as a tool for modeling reality.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics are not specified but see objectives which gives a detailed topic list.**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised:

1. Course number and name
   **MA153, Calculus II: Part A**

2. Credits and contact hours
   **2**

3. Instructor's or course coordinator's name
   **Cornelius Nelan**

4. Text book, title, author, and year
   ***Early Transcendental Functions: Edition 7e*, Larson and Edwards, 2019**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **Students in this course study techniques of integration and infinite sequences and series. Techniques studied include u-substitution, integrals involving logarithms and inverse trigonometric functions, trigonometric integrals, trigonometric substitution, integration by parts, and partial fractions. For infinite series, the course includes a study of convergence, tests of convergence, power series, and Taylor and Maclaurin series. Additional topics include indeterminate forms, L'Hopital's Rule, and improper integrals. Offered the first half of each semester.**

   b. prerequisites or co-requisites
      **Prerequisites: MA141 or MA151 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives**

      1. **To continue exploration of the concept of derivative and integral in single variable calculus**
      2. **To problem solve using various techniques to compute anti-derivatives**
      3. **To approximate integrals using numerical methods.**
      4. **To study calculus of the infinite using improper integrals and infinite sums.**
      5. **To study limits using L'Hospital's Rule**
      6. **To study sequences and series.**
      7. **To learn numerical methods of computing values of transcendental functions like sin x, using Taylor series.**
      8. **To explain how calculators and computers compute esoteric values.**
      9. **To lay the foundation for further study in calculus, physics, and engineering.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **review of derivatives,**

- **integrals, antiderivatives, u-substitutions.**
- **integration by parts, trigonometric integrals**
- **trigonometric substitutions,**
- **integration using partial fractions,**
- **numerical methods**
- **improper integrals,**
- **L'Hopital's Rule**
- **sequences and series, convergence and divergence, tests for convergence**
- **power series, Taylor series, numerical calculations**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA154, Calculus II: Part B**

2. Credits and contact hours
   **2**

3. Instructor's or course coordinator's name
   **Cornelius Nelan**

4. Text book, title, author, and year
   ***Early Transcendental Functions: Edition 7e*, Larson and Edwards, 2019**

   a. Other supplemental materials
      **Access to WebAssign and a graphing calculator (TI-83 or TI-84 recommended)**

5. Specific course information

   a. Catalog description of the content of the course
      **In this course students study differential equations, conic sections, parametric equations, polar coordinates, vectors, operations on vectors, lines and planes in space, three-dimensional coordinate systems (cylindrical and spherical coordinates) and quadric surfaces. Offered the second half of each semester.**

   b. prerequisites or co-requisites
      **Prerequisites: MA151 or MA150 (Minimum Grade C-)**
      **Corequisites: Take MA153.**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**

      1. **Analyze equations and properties of parabolas, ellipses, and hyperbolas.**
      2. **To understand the polar coordinate system.**
      3. **Rewrite rectangle coordinates into parametric and polar coordinates and vice versa.**
      4. **To find different ways to describe curves in two and three dimensions: parametric equations, polar coordinates.**
      5. **To use parametric and polar coordinates to compute area and arc length.**
      6. **To solve first order differential equations in one variable by observation, separation of variables, and other techniques.**
      7. **To use differential equations to model real-life problems and solve them: growth, decay, etc.**
      8. **To understand vectors in two and three dimensions.**
      9. **To use various operations to analyze vectors: dot product, scalar product, cross product, norms, projections, etc.**
      10. **To write the equation for lines and planes in space.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

- **Review of MA 153;**
- **Conic sections: parabolas, ellipses, and hyperbolas;**
- **Parametric Equations**
- **Polar Coordinates, Applications of Polar Coordinates to area and arc length**
- **General and Specific solutions to differential equations, Slope fields and Euler's method, Applications: Separation of variables, Linear Differential equations**
- **Vectors in two and three dimensions: Lines and planes in space.**
- **Operations on vectors: dot product, cross product.**
- **Cylindrical and Spherical Coordinates (time permitting)**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA205, Introduction to Discrete Math**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Cornelius Nelan**

4. Text book, title, author, and year
   ***An Introduction to Discrete Mathematics (2nd Ed.)*, Steven Roman, 1989**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course introduces students to basic concepts and structures of discrete mathematics. Topics can include propositional and predicate logic, sets and set operations, functions, proof techniques, counting problems, probability and basic number theory. Applications include computer science, biology, social sciences, law and the physical sciences.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC110 or (MA110 or higher) (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Not specified.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Logic: truth tables and logical arguments, logic circuits, and Boolean functions.**
   - **Induction and Recursive Algorithms.**
   - **Relations and functions: equivalence relations, order relations, isomorphisms, topological sorts, properties of relations and functions.**
   - **Counting Techniques: The Fundamental Principle of Counting, combinations, permutations, the principle of inclusion-exclusion, the pigeonhole principle.**
   - **Graph Theory: Terminology, paths, Eulerian and Hamiltonian Paths.**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA229, Linear Algebra**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Louis Deaett**

4. Text book, title, author, and year

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course covers the basic concepts of linear algebra, along with an introduction to the language and techniques of formal mathematics. Topics include systems of linear equations, vector spaces, linear transformations, matrices, determinants and eigenvalues.**

   b. prerequisites or co-requisites
      **None**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**

      **1. TBD**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **TBD**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA285, Applied Statistics**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **K. James Soda**

4. Text book, title, author, and year
   **Probability and Statistics for Engineering and the Sciences, Jay L. Devore, 2015**

   a. Other supplemental materials
      **Access to WebAssign, laptop with R (programming language) installed**

5. Specific course information

   a. Catalog description of the content of the course
      **This introductory statistics course is intended primarily for students majoring in engineering, mathematics or the sciences. Emphasis is on using statistics to answer questions in the physical and social sciences. Topics include descriptive statistics, probability, point and interval estimation, hypothesis testing, correlation and regression, analysis of variance, chi-square tests and nonparametric methods. Students are required to analyze real data sets using Excel, SAS, SPSS or similar computer programs. Students are not allowed to receive credit for more than one of the following courses: MA 206, MA 275 and MA 285.**

   b. prerequisites or co-requisites
      **Prerequisites: MA141, MA151 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**

      1. **Students will describe real-world data using descriptive statistics and visualizations and will identify patterns in the data using these tools.**
      2. **Students will associate real-world systems with probability distributions and use these distributions to answer scientific questions.**
      3. **Students will use tools from probability theory and statistics to describe systems whose attributes vary, estimate common values for these attributes, and provide uncertainty quantification for these estimates.**
      4. **Students will use statistical inference to assess the veracity of hypotheses in the natural, social, and applied sciences.**
      5. **Students will use the relationship between two or more random variables to infer functional relationships in empirical systems and predict unknown states of these systems.**
      6. **Students will evaluate the effectiveness of a statistical analysis to discern whether the analysis's conclusions are valid.**
      7. **Students will implement common statistical techniques using R.**

(b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
**None**

7. Brief list of topics to be covered
**Lecture Topics**

- **Introduction to Statistics, Data, and R**
- **Data Visualization**
- **Probability Spaces and Functions**
- **Bernoulli Trials and Associated Distributions**
- **Continuous Random Variables**
- **Normal Distribution**
- **Poisson Processes**
- **Point Estimators**
- **Confidence Intervals**
- **Principles of Hypothesis Testing**
- **One-Factor ANOVA**
- **Joint Probability**
- **Contingency Tables**
- **Covariance and correlation**
- **Regressions (Linear, Mutliple, Curvilinear)**
- **Non-parametric Tests**
- **Likelihood**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised:

1. Course number and name
   **MA301, Foundations of Advanced Mathematics**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **David Herscovici**

4. Text book, title, author, and year

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course is an exploration of the language and nature of mathematics. Emphasis is placed on developing the students' ability to construct and write mathematical proofs and helping students read and understand mathematical reasoning. Various techniques of proof are discussed, including direct, contrapositive, induction, contradiction and counterexample. Mathematical content includes elementary logic, quantifiers, set theory, relations, functions and number systems. Other topics are at the instructor's discretion, and may include number theory, graph theory, point-set topology or counting problems.**

   b. prerequisites or co-requisites
      **Prerequisites: MA229 or MA205 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**

      **1. TBD**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **TBD**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA305, Discrete Math**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Cornelius Nelan**

4. Text book, title, author, and year
   ***Discrete Mathematics*, Gary Chartrand and Ping Zhang, Waveland Press, 2011**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **Students study various topics in discrete mathematics, such as proof by induction, recurrence relations, cardinality of a set, the pigeonhole principle, counting techniques, probability and graph theory.**

   b. prerequisites or co-requisites
      **Prerequisites: MA205 or MA301 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **None specified explicitly.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Logic: truth tables and logical arguments**
   - **Proof Techniques: direct proofs, proof by contradiction, inductive proofs, and countability arguments.**
   - **Relations and functions: equivalence relations, order relations, isomorphism's, topological sorts, properties of relations and functions.**
   - **Counting Techniques: The Fundamental Principle of Counting, combinations, permutations, the principle of inclusion-exclusion, the pigeonhole principle**
   - **Graph Theory; Terminology, paths, Eulerian and Hamiltonian Paths.**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA321, Abstract Algebra**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Jill Shahverdian**

4. Text book, title, author, and year
   ***Abstract Algebra (4rd Ed.)*, John A. Beachy and William Blair, Waveland Press, 2019**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course presents a study of topics selected from groups, normal groups, rings, ideals, integral domains, fields, polynomial rings and isomorphism theorems.**

   b. prerequisites or co-requisites
      **Prerequisites: MA229, MA301 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Not specified explicitly.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Not specified explicitly. '**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA370, Number Theory**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Louis Deaett**

4. Text book, title, author, and year

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **Topics include representation of integers, primes, the Fundamental Theorem of Arithmetic, divisibility, modular arithmetic, Fermat's Little Theorem and Euler's Theorem, perfect numbers, and Diophantine equations. Additional topics may include quadratic residues, sums of squares, and Fermat's Last Theorem.**

   b. prerequisites or co-requisites
      **Prerequisites: any 300-level Math course (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**

      **1. TBD**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **TBD**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA380, Data Mining (DS380)**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Jesse Kalinowski**

4. Text book, title, author, and year
   **None**

   a. Other supplemental materials
      **Optional: R for Data Science, Hadley Wickham and Garrett Grolemund, 2017**
      **Optional: R and Data Mining, Yanchang Zhao, 2015**

5. Specific course information

   a. Catalog description of the content of the course
      **This course introduces students to data mining concepts and techniques, and data mining software. Topics include data preprocessing and cleaning, concept hierarchy generation, attribute relevance analysis, association rule mining and decision tree induction.**

   b. prerequisites or co-requisites
      **Pre/co-requisite: EC365**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **None specified.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics may include**

   - **R programming,**
   - **data visualization,**
   - **data structures,**
   - **classification,**
   - **cluster analysis,**
   - **text mining**
   - **NLP**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **MA385, Machine Learning (DS385)**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Jesse Kalinowski**

4. Text book, title, author, and year
   **An Introduction to Statistical Learning, Gareth James, Daniela Witten, Trevor Hastie and Rob Tibshirani**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course introduces students to the theory of machine learning and practical applications. Topics include supervised learning, unsupervised learning, learning theory, regularization models, validation and models.**

   b. prerequisites or co-requisites
      **Prerequisites: MA380 (DS380)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **None specified.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **linear regression**
   - **logistic regresssion**
   - **linear discriminant analysis**
   - **k-nearest neighbors**
   - **resampling methods**
   - **model selection and regularization**
   - **non-linear models**
   - **tree-based methods**
   - **support vector machines**
   - **unsupervised learning**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **CSC106, Introduction to Programming for Engineers**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Christian Duncan (Coordinator)**

4. Text book, title, author, and year
   ***MATLAB: An introduction with Applicatons, Sixth Edition*, Amos Gilat, 2016 (ISBN: 978-1-119-25683-0).**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course serves as an introduction to computer science and computer programming for engineers. Topics include fundamental programming constructs, problem-solving techniques, basic data and control structures, and simple data structures and arrays. This course is for non-CSC and non-SER majors.**

   b. prerequisites or co-requisites
      **None**

   c. indicate whether a required, elective, or selected elective
      **Required**[5]

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**
      - **Discuss the challenges inherent in communicating with (programming) a (non-reasoning) computer;**
      - **Break a complex problem down into smaller more manageable components;**
      - **Provide step-by-step instructions to solve small computational problems;**
      - **Using at least one programming language**[6]**, write examples of and solve problems in programs with the following basic programming constructs and tools:**
        i. **mathematical expressions,**
        ii. **conditional expressions,**
        iii. **simple iterative statements,**
        iv. **simple functions,**
        v. **simple data structures, such as arrays, lists, and strings; and**
      - **Discuss the importance of commenting and good code structure and style.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C1, C2, C6**

7. Brief list of topics to be covered
   **Lecture Topics**

[5]Some CSC majors can take this option if starting in Engineering and switching to CSC. CSC106 and CSC107 can be substituted for CSC110 and CSC110L.

[6]In this case, the language shall be MATLAB.

- **Math operations, functions, and variables**
- **Script files**
- **Arrays (creating, accessing, and updating)**
- **Strings**
- **Array Operations (Adding, Subtracting, Multiplying, Dividing, Scalar, Element-by-element)**
- **Input and Output**
- **Plotting (2D)**
- **Boolean Operations**
- **Conditional Statements**
- **Loops (Simple and Nested)**
- **Function Files**
- **Anonymous Functions, Function Functions, Subfunctions, nested functions**
- **Final Design Project**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised:

1. Course number and name
   **CSC107, Structured Programming Techniques**

2. Credits and contact hours
   **1**

3. Instructor's or course coordinator's name
   **Christian Duncan (Coordinator)**

4. Text book, title, author, and year
   **None.**

   a. Other supplemental materials
      **None. Blackboard (LMS) pages link to various videos, short tutorials, readings, etc.**

5. Specific course information

   a. Catalog description of the content of the course
      **The main purpose of this course is to fill any gaps between the Programming and Problem Solving course (CSC 110) and the Introduction to Programming for Engineers course (CSC 106) or similar introduction to programming course. Topics include a basic programming refresher, binary number representation, debugging strategies and simple recursion.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC106 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Required**[7]

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**
      - **Discuss the challenges inherent in communicating with (programming) a (non-reasoning) computer;**
      - **Break a complex problem down into smaller more manageable components;**
      - **Provide step-by-step instructions to solve small computational problems;**
      - **Using at least one programming language**[8]**, write examples of and solve problems in programs with the following basic programming constructs and tools:**
        i. **mathematical expressions,**
        ii. **conditional expressions,**
        iii. **simple iterative statements,**
        iv. **simple functions,**
        v. **simple data structures, such as arrays, lists, and strings; and**
      - **Discuss the importance of commenting and good code structure and style.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C1, C2, C6**

7. Brief list of topics to be covered
   **Lecture Topics (course is broken down into modules)**

[7]Some CSC majors can take this option if starting in Engineering and switching to CSC. CSC106 and CSC107 can be substituted for CSC110 and CSC110L.

[8]In our case, the language shall be Java.

- **Module 0: Reviewing syllabus, policies, and other course materials**
- **Module 1: Setting up the basic Java environment (and a little about Object-Oriented programming)**
- **Module 2: Exploring the nature of storing and computing numbers in binary**
- **Module 3: Beginning to program in Java, the basics of imperative programming**
- **Module 4: Beginning to program in Java, the basics of functional programming**
- **Module 5: Debugging programs**
- **Module 6: Exploring the basic nature of recursion, in mathematics and programming**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised:

1. Course number and name
   **CSC 110, Programming and Problem Solving**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Prof. Jonathan Blake**

4. Text book, title, author, and year
   **Introduction to Programming and Problem-Solving Using Scala, Second Edition by Mark Lewis and Lisa Lacher (2016)**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course is an introduction to computer programming. While we will be studying the Scala programming language, we will be focusing on good programming practice and introductory prob- lem solving techniques that will provide you with the tools to write efficient, correct code in any programming language. This course is not just a programming course! Note that this course is a synchronus WEB course run as a flipped classroom. Students prepare for each class/module by completing outside work (videos, readings, quizzes, etc) and spend class time synchronously working either individually or in groups on small projects. When learning to program, there is no substitute to writing code, and we will spend as much time as possible doing that this semester.**

   b. prerequisites or co-requisites
      **Corequisite: CSC110L**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Learning Objectives (the student will be able to):**

      - **Discuss the challenges inherent in communicating with (programming) a (non-reasoning) computer**
      - **Break a complex problem down into smaller more manageable components**
      - **Provide step-by-step instructions to solve small computational problems**
      - **Using at least one programming language, write examples of and solve problems in pro- grams with the following basic programming constructs and tools**
        - **Mathematical expressions**
        - **Conditional expressions**
        - **Simple iterative statements**
        - **Simple functions**
        - **Simple data structures, such as arrays, lists, and strings**
      - **Discuss the importance of commenting and good code structure and style**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C1, C2, C6**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Introduction**
   - **Scala Basics**
   - **Conditionals**
   - **Functions**
   - **Intro to Loops**
   - **Recursion**
   - **Collections**
   - **State machines**
   - **Loops Revisited**
   - **Function Parameters**
   - **Text Files**
   - **Case Classes**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (6/27/2021)

1. Course number and name
   **CSC 110L, Programming and Problem Solving Lab**

2. Credits and contact hours
   **1 (1.25)**

3. Instructor's or course coordinator's name
   **Prof. Emre Tokgoz**

4. Text book, title, author, and year
   ***See CSC110 Syllabus***

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **Students gain experience in the practice of programming and problem solving by completing a series of hands-on activities, which increase in complexity, covering a range of topics from the CSC 110 course. This course is taken in conjunction with CSC 110.**

   b. prerequisites or co-requisites
      **Corequisite: CSC110**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      ***See CSC110 Syllabus***

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **None listed**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (6/28/2021)

1. Course number and name
   **CSC 111, Data Structures and Abstraction**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Stefan Christov**

4. Text book, title, author, and year
   ***Data Abstraction and Problem Solving with Java: Walls and Mirrors (3rd Edition)*** **by Janet Prichard and Frank Carrano, 2010**

   a. Other supplemental materials

5. Specific course information

   a. Catalog description of the content of the course
      **This course is a continuation of CSC110. Topics include advanced data structures (linked lists, stacks, queues, and trees), recursion, abstract data types, sorting and search algorithms, and object-oriented programming.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC110, CSC110L (Minimum Grade C-)**
      **Corequisites: CSC111L**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**

      - **Design, write, document, and test sophisticated programs using an object-oriented language.**
      - **Identify situations where recursion is an appropriate problem solving strategy.**
      - **Compare array and linked data structures and implement problem solutions using each.**
      - **Describe the characteristics of stack and queue data structures and implement problem solutions using each.**
      - **Describe characteristics of tree data structures and implement problem solutions using them.**
      - **Explain search and sorting methods and implement programs using each.**
      - **Describe factors that determine algorithm efficiency and measure the efficiency of searching and sorting algorithms.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C1 (CLOs 1-7), C2 (CLOs 1,7), C3 (CLO 1), C6 (CLOs 1-7)**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Course intro, Java: syntax, branching, loops, program structure**
   - **Object-oriented programming: classes and objects**

- **Java: standard I/O, file I/O, exceptions**
- **Recursion**
- **Algorithm efficiency, linear search, binary search**
- **Sorting algorithms: selection sort, bubble sort, insertion sort, merge sort, quick sort**
- **ADTs; List ADT, List implementations: array-based and linked list**
- **Stacks, Postfix notation**
- **Queues**
- **Trees**
- **Hashing**

Prepared by: Stefan Christov
Creation date: 06/29/2021
Revised:

1. Course number and name
   **CSC 210, Computer Architecture and Organization**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Prof. Jonathan Blake**

4. Text book, title, author, and year
   **Essentials of Computer Organization and Architecture by Null and Lobur (2018)**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **Students are introduced to the organization and architecture of computers. Topics related to computer or- ganization include digital logic, data representation, computer arithmetic, data path and control unit im- plementation, memory system organization, and I/O communications. Architecture topics include machine language programming, instruction set design, and factors affecting processor performance.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC111 and CSC111L (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Learning Objectives (the student will be able to):**
      - **Understand number conversion and representation**
      - **Implement logic functions with gates**
      - **Build simple chips/components using logic gates**
      - **Implement complex processor components using simple chips**
      - **Understand the software/hardware interface**
      - **Implement solutions to simple programming problems in assembly language**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None C1, C2**

7. Brief list of topics to be covered
   **Course Topics**

   - **Introduction to architecture and organization**
   - **Binary numbers**
     - **Number representation**
     - **Number conversion**
     - **Signed numbers**
     - **Floating point representation**
   - **Binary arithmetic**

- **Boolean algebra**
- **Logic gates**
- **Combinational and sequential circuits**
- **CPU organization**
- **Data path**
- **memory organization**

Prepared by: Christian Duncan
Creation date: 06/26/2021
Revised: Jonathan Blake (6/27/2021)

1. Course number and name
   **CSC215, Algorithm Design and Analysis**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Christian Duncan**

4. Text book, title, author, and year
   **The OpenDSA project.**

   - **The version used is associated with a Canvas course.**
   - **Here is a link to a non-live but interactive version,** `http://lti.cs.vt.edu/LTI_ruby/Books/CSC215/html/`
   - **The original non-interactive version: *Data Structures and Algorithm Analysis (3.2 - Java Edition)*, by Clifford Shaffer**
   - **Available as a PDF:** `http://people.cs.vt.edu/~shaffer/Book/JAVA3elatest.pdf`

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course presents a study of the design and analysis of algorithms. Topics include asymptotic analysis, complexity theory, sorting and searching, underlying data structures, recursion, greedy algorithms, divide and conquer, dynamic programming, and NP-completeness. Additional topics may include graph algorithms, probabilistic algorithms, distributed computing and parallel algorithms.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC111, MA205 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**

      1. **Use mathematical and computational concepts, such as inductive reasoning and recurrence relations, to analyze an algorithm's asymptotic run-time performance;**
      2. **Use creative thinking skills in solving computational problems;**
      3. **Apply brute-force, exhaustive search, dynamic programming, and greedy techniques in developing algorithmic solutions;**
      4. **Apply decrease-and-conquer (prune-and-search) and divide-and-conquer techniques in developing algorithmic solutions;**
      5. **Describe and apply various advanced data structures such as balanced binary trees, heaps, hashtables, and graphs in the design and analysis of efficient algorithms;**
      6. **Explain the basic premise behind the class of NP-complete problems; and**
      7. **Use experimental analysis to test the practical validity of a data structure or algorithm.**

(b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
**C1 (CLO 1, 2, 3, 4, 5), C2 (CLO 7), C3 (CLO 6), C6 (CLO 2, 3, 4, 5)**

7. Brief list of topics to be covered
**Lecture Topics**

- **Motivation for proof writing and asymptotic analysis**
- **Discrete Math review**
- **Data Structures review**
- **Asymptotic Analysis**
- **Recursion**
- **Binary (Search) Trees**
- **Heaps and Priority Queues**
- **Sorting Algorithms (Quadratic, Divide-and-Conquer, Heap, Radix)**
- **Hashing and Hashtables**
- **Recurrence Relations and Master Theorem**
- **Graphs and Graph Algorithms**
- **Basic NP-Completeness**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised:

1. Course number and name
   **CSC240, Introduction to Computer Security (was CSC300 for a few offerings)**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Christian Duncan**

4. Text book, title, author, and year
   ***Introduction to Computer Security*, Michael T. Goodrich and Roberto Tamassia, 2010**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course introduces the general principles of computer security from an applied perspective. Topics covered include various forms of physical and cyber attacks, recognizing and defending against machine and network vulnerabilities, the basic building blocks of secure systems, basic cryptography and the social aspects of security.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC111, CSC111L (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Outcomes (the student will be able to):**

      **i. Discuss security related issues with regards to physical access**
      **ii. Recognize and exploit vulnerabilities in Operating Systems**
      **iii. Recognize and exploit vulnerabilities in Network and Web-based Systems**
      **iv. Use simple cryptographic tools and techniques to encrypt, decrypt, and crack messages**
      **v. Be able to discuss the social implications around privacy versus security**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C1 (CLO 2, 3, 4) C3 (CLO 5), C4 (CLO 5), C5**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **General Introduction to Computer Security**
   - **Physical Security**
   - **Operating Systems Security**
   - **Malware**
   - **Network Security**
   - **Web Security**
   - **Cryptography**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised:

1. Course number and name
   **CSC310, Operating Systems**
2. Credits and contact hours
   **3**
3. Instructor's or course coordinator's name
   **Prof. Dennis Klemenz**
4. Text book, title, author, and year
   **No required textbook**
   a. Other supplemental materials
      **Optional book:**
      **Operating Systems, Stallings, Seventh Edition. Prentice-Hall**
5. Specific course information
   a. Catalog description of the content of the course
      **Students are introduced to operating systems and the software to support these systems. Topics include operating system principles, concurrency, scheduling and dispatch, virtual memory, device management, security and protection, file systems and naming, and real-time systems.**
   b. prerequisites or co-requisites
      **Prerequisites: CSC210 and SER225 (Minimum Grade C-)**
   c. indicate whether a required, elective, or selected elective
      **Required**
6. Specific goals for the course
   (a) specific outcomes of instruction
      **None listed (See topic list below)**
   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**
7. Brief list of topics to be covered

   **(a) Management of Processes, Threads and Processor Resources**
   **(b) Interprocess Communication (Semaphores and Scheduling)**
   **(c) Multiple Processor Systems & Virtualization (Cloud Computing)**
   **(d) Memory Management (Virtual Memory and Paging)**
   **(e) File Systems (Directories and Files)**
   **(f) Input/Output (Hardware & Software)**
   **(g) Management of Deadlocks (Avoidance & Recovery)**
   **(h) Security (Mechanisms, Authentication, Code Exploits)**
   **(i) Case Studies of major market Operating Systems & uses (Linux, Windows 10, Desktop vs. Mobile OS)**
   **(j) Hands-on programming with xv6 operating system**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised: Jonathan Blake (06/28/2021)

1. Course number and name
   **CSC315, Theory of Computation (cross-listed with MA315)**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Christian Duncan**

4. Text book, title, author, and year
   ***Theory of Computation, 3rd Edition*, Sipser, 2012**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course provides an introduction to the classical theory of computer science. In particular, it covers automata, formal languages, computability, and complexity.**

      **Our aim in this course is to develop a fundamental understanding of the nature of computing. Throughout all the topics, we will answer one underlying question stated on page 1 of the course textbook:**

      **"What are the fundamental capabilities and limitations of computers?"**

      **We will look at sub-questions like: "What can be computed?"; "How do you prove something cannot be computed? (Is this even possible?)"; "What makes some problems so much harder than others to solve?"**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215 or MA301 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Outcomes (the student will be able to):**

      1. **Create finite state and push-down automata with specific properties (to recognize specific languages).**
      2. **Create regular and context-free grammars with specific properties (to generate specific languages).**
      3. **Use the pumping lemma to show particular problems cannot be solved by finite state automata (particular languages are not regular).**
      4. **Use the pumping lemma to show particular problems cannot be solved by push-down automata (particular languages are not context-free).**
      5. **Create Turing Machines to solve particular problems (to recognize specific languages).**
      6. **Use diagonalization or reducibility methods to prove a problem is undecidable.**
      7. **Explain the importance of NP-completeness and the "P=NP" problem.**
      8. **Use reducibility to prove a problem is NP-complete.**
      9. **Explain the relationship between deterministic and non-deterministic computation time and space.**

(b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
**C1 (CLO 1, 2, 5), C3 (CLO 3, 4, 6, 7, 8, 9), C6 (CLO 1, 2, 5)**

7. Brief list of topics to be covered
**Lecture Topics**

- **Mathematics Review**
- **Regular Languages**
- **Context-Free Languages**
- **Church-Turing Thesis (Turing Machines)**
- **Decidability**
- **Reducibility**
- **Time Complexity**
- **NP-Completeness**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised:

1. Course number and name
   **CSC318, Cryptography (MA318)**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **David Herscovici**

4. Text book, title, author, and year
   ***Introduction to Cryptography with Coding Theory, second edition*, Wade Trappe and Lawrence C. Washington, Pearson/Prentice Hall, 2007**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **Students study methods of transmitting information securely in the face of a malicious adversary deliberately trying to read or alter it. Participants also discuss various possible attacks on these communications. Students learn about classical private-key systems, the Data Encryption Standard (DES), the RSA public-key algorithm, discrete logarithms, hash functions and digital signatures. Additional topics may include the Advanced Encryption Standard (AES), digital cash, games, zero-knowledge techniques and information theory, as well as topics chosen by the students together with the instructor for presentations.**

   b. prerequisites or co-requisites
      **Prerequisites: MA229 or CSC215 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**[9]

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Not specified.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Basic framework; Congruences; Modular arithmetic; Shift ciphers; Affine ciphers**
   - **Greatest Common Divisors (gcd's); The Euclidean Algorithm and the extended Euclidean algorithm; Modular inverses; Attacking affine ciphers; using programs**
   - **Vigenere ciphers; Substitution ciphers**
   - **Matrix operations; the Hill cipher; Binary and hexadeimal representation of numbers; One-time pads**
   - **Data Encryption Standard (DES): simplified and normal version**
   - **Attacking DES; Finite fields; the Advanced Encryption Standard (AES)**

[9]Students can take this as either a CSC elective or a Math elective, but not both.

- **Introduction to the RSA algorithm; Modular Exponentiation; the Chinese Remainder Theorem**
- **Fermat's and Euler's Theorems; the Euler function;**
- **Public key cryptography; Digital signatures**
- **Primality testing; factoring methods; the RSA challenge; the Quadratic Sieve**
- **Primitive roots; Discrete logarithms; the ElGamal cryptosystem; the Pohlig-Hellman algorithm**
- **Hash functions; Birthday attacks**
- **The Secure Hash Algorithm (SHA); Diffie-Hellman key exchange;**

Prepared by: Christian Duncan
Creation date: 06/29/2021
Revised:

1. Course number and name
   **CSC340, Networking and Distributed Processing**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Christian Duncan**

4. Text book, title, author, and year
   ***Computer Networks, 5th Edition*, Tanenbaum and Wetherall, 2010**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **This course introduces students to net-centric computing, the web as an example of client-server computing, building internet and web applications, communications and networking, distributed object systems, collaboration technology and groupware, distributed operating systems and distributed systems.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215, SER225 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Outcomes (the student will be able to):**

      **1. Explain inherent challenges in network communications;**
      **2. Describe the primary layers of computer networks;**
      **3. Apply the standard protocols that form the basis of the Internet;**
      **4. Explain legal and ethical principles around network communications;**
      **5. Develop, as a team, basic multi-threaded network applications; and**
      **6. Use distributed computing to solve computational problems.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C1 (CLO 3, 5, 6) C2 (CLO 5, 6), C4 (CLO 4), C5 (CLO 5) C6 (CLO 5, 6)**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **The layers of a Network**
   - **Network applications including DNS, Email, and the Web**
   - **Threading (for Distributed Processing in Networks)**
   - **Client-Server Model**
   - **Transport Layer (TCP): sockets, sequence numbering, connection request (three-way handshake), connection release (two generals' problem), flow control, and packet parsing**
   - **Network Layer (IP): routing algorithms, congestion control, internet protocol (IPv4/IPv6), internetworking,**

- **Serialization**
- **Designing and developing a multi-player networked game**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised:

1. Course number and name
   **CSC345, Computer Graphics**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Christian Duncan**

4. Text book, title, author, and year
   **Introduction to Computer Graphics by David J. Eck.**

   a. Other supplemental materials
      **None. Other online resources are suggested as supplements when needed.**

5. Specific course information

   a. Catalog description of the content of the course
      **This course is an introduction to theory and programming in computer graphics. Topics include graphic systems, fundamental techniques in graphics, basic rendering, basic geometric modeling, visualization, virtual reality, computer animation, advanced rendering and advanced geometric modeling.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215, SER225 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Outcomes (the student will be able to):**

      **1. Use linear algebraic operations to manipulate objects in a 3D environment;**
      **2. Explain how matrix transformations affect the coordinate system;**
      **3. Explain how the material properties of the object and the light sources in the scene affect the overall color of an object that is drawn;**
      **4. Write a 2D graphics program using a modern graphics library;**
      **5. Write a simple animated 3D graphics program using a modern graphics library;**
      **6. Write a program to navigate a 3-dimensional scene using a modern graphics library.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C1 (CLO 1, 2, 3, 4, 5, 6) C2 (CLO 4, 5, 6), C6 (CLO 1, 2, 3, 4, 5, 6)**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Introduction to Graphics Programming**
   - **Two-dimensional Graphics**
   - **Basic Linear Algebra (vector, matrix operations)**
   - **OpenGL (1.1) and Three-dimensional Graphics**
   - **3D Scene Graphs**
   - **WebGL**

- **Smooth (Gouraud) Shading**
- **Hidden Surface Removal**
- **Phong illumination model (ambient, diffuse, specular lighting)**
- **Texture mapping**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised:

1. Course number and name
   **CSC350, Intelligent Systems**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Christian Duncan**

4. Text book, title, author, and year
   ***Artificial Intelligence: A Modern Approach*, AIMA Third Edition, Stuart Russell and Peter Norvig, 2009**

   a. Other supplemental materials
      **None.**

5. Specific course information

   a. Catalog description of the content of the course
      **Artificial Intelligence is an umbrella topic covering efforts in a variety of fields all searching for one goal: to get computers to perform well at tasks at which humans excel. Topics include fundamental issues in intelligent systems, search and optimization methods, knowledge representation and reasoning, learning, agents, computer vision, natural language processing, pattern recognition, advanced machine learning, robotics, knowledge-based systems, neural networks and genetic algorithms.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215, SER225 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Outcomes (the student will be able to):**

      **1. Recognize problems that may be solved using artificial intelligence and machine learning.**
      **2. Apply basic AI strategies and algorithms such as knowledge representation techniques, search algorithms, and machine learning techniques to solve problems.**
      **3. Discuss the major areas and challenges of AI.**
      **4. Discuss the ethical issues surrounding the use of AI.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C1 (CLO 1, 2) C2 (CLO 1, 2) C4 (CLO 3, 4), C5 (CLO 2), C6 (CLO 2)**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **User agents, reflect (hard-coded) technique**
   - **Unsupervised Learning**
   - **Minimax and Alpha-beta search**
   - **Neural Networks**
   - **Support Vector Machines**

- **Naive-Bayes Model**
- **Ethical Issues of Artificial Intelligence**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised:

1. Course number and name
   **CSC491, Senior Project I**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Mark Hoffman**

4. Text book, title, author, and year
   **None**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **Senior Project I is the first part of a two-semester, capstone experience for computer science students. Students analyze and develop a solution to a major project that requires integration and application of knowledge and skills acquired in earlier coursework. Students develop professional experience by working on a team and communicating progress and results to a variety of audiences. Students explore the ethical and legal responsibilities of a computing professional.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215, SER225 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Outcomes (the student will be able to):**

      1. **Analyze a significant computing problem (software development or research) that requires the application of computing principles.**
      2. **Develop solutions to a significant computing problem by applying relevant disciplinary principles.**
      3. **Communicate (written and oral) effectively in a variety of professional contexts.**
      4. **Function effectively as a team member or leader.**
      5. **Explain the ethical and legal responsibilities of a computing professional, and apply ethical and legal principles to the analysis of a computing problem.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None C1 (CLO 1,2), C3 (CLO 3), C4 (CLO 5), C5 (CLO 4),**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Project selection and creating a vision document**
   - **ACM Code of Ethics**
   - **Systems Requirement Document**

- **Systems Design Document**
- **Prototyping**
- **Project Demo**
- **Professional Development: Job search, interview skills, community outreach**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised:

1. Course number and name
   **CSC492, Senior Project II**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Mark Hoffman**

4. Text book, title, author, and year
   **None**

   a. Other supplemental materials
      **None**

5. Specific course information

   a. Catalog description of the content of the course
      **Senior Project II is the second part of a two-semester, capstone experience for computer science students. Students implement and evaluate a solution to a major project that requires integration and application of knowledge and skills acquired in earlier coursework. Students continue to develop professional skills in teamwork and communications, and knowledge of their responsibilities as computing professionals.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC491 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Outcomes (the student will be able to):**

      1. **Implement a solution to a computing problem (software development or research) that requires the application of computing principles.**
      2. **Communicate (written and oral) effectively in a variety of professional contexts.**
      3. **Function effectively as a team member or leader.**
      4. **Explain the ethical and legal responsibilities of a computing professional, and apply ethical and legal principles to the analysis of a computing problem.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None C2 (CLO 1), C3 (CLO 2), C4 (CLO 4), C5 (CLO 3), C6 (CLO 1)**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Project Development**
   - **Ethics: Zero-Day Exploits**
   - **Project Demo**
   - **Poster and QuadChart Preparation**
   - **Final Presentation**
   - **Professional Development: Alumni visitation**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised:

1. Course number and name
   **SER 225, Introduction to Software Development**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Mark Hoffman**

4. Text book, title, author, and year
   **The Pragmatic Programmer, Andrew Hunt and David Thomas, 2000.**
   **The Mythical Man-Month, F.P. Brooks, 1995.**
   **The Case of the Killer Robot, Richard G. Epstein, 1997.**

   a. Other supplemental materials
      **A code base for a software system that students maintain as part of a semester-long project**

5. Specific course information

   a. Catalog description of the content of the course
      **This course presents introductory software engineering concepts including group development, large-scale project work, and theoretical aspects of object-oriented programming. The course expands on material from previous courses. Professional behavior and ethics represent an important component of this course.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC 111, CSC111L (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Required**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**
      - **Evaluate and maintain an existing software product.**
      - **Develop clear, concise, and sufficiently formal life-cycle artifacts including requirements, design, implementation, and test documentation for software systems based on needs of users and stakeholders.**
      - **Explain the value of construction technologies such as version control and design tools to assist the software development practice.**
      - **Explain the purpose of testing and apply it to manage an existing software product.**
      - **Work on a team and communicate, orally and in writing, a software design to various audiences.**
      - **Explain the social and ethical implications of the software development process.**
      - **Demonstrate the ability to think critically and be reflective learners.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C1 (CLOs 1-4), C2 (CLOs 1, 2), C3 (CLOs 2, 5), C4 (CLO 6), C5 (CLO 5), C6 (CLOs 1-4)**

7. Brief list of topics to be covered
   **Lecture Topics**

- **Customer requirements, user stories**
- **Test planning**
- **Bug identification and prioritization**
- **Version control**
- **Scrum process management**
- **Teamwork**
- **Presentation skills**
- **Ethics in software development**

Prepared by: Stefan Christov
Creation date: 06/29/2021
Revised:

1. Course number and name
   **SER305, Advanced Computational Problem Solving**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Stefan Christov**

4. Text book, title, author, and year
   **None required.**
   **Optional reading material:**
   **How to Solve It by Computer, R. G. Dromey, 1982**
   **Cracking the Coding Interview, Gayle Laakmann, 2010**
   **Java in a Nutshell, David Flanagan, 2005**

   a. Other supplemental materials

5. Specific course information

   a. Catalog description of the content of the course
      **This course presents computational problem solving and advanced algorithmic thinking techniques. It expands on material from previous courses. Students also learn about advanced APIs and software development frameworks, including APIs for advanced collections and concurrent programming, and gain additional experience with frameworks for testing and building software systems.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215, SER120, SER120L (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**
      - **Apply strategies for computational problem solving**
      - **Design and implement algorithmic solutions to various computational problems**
      - **Analyze the runtime and space complexity of algorithmic solutions**
      - **Argue the correctness of algorithmic solutions**
      - **Compare and contrast fundamental algorithms and data structures in various areas of computational problem solving**
      - **Compare and contrast alternative approaches for tackling non-trivial unstructured computational problems**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **Other outcomes addressed:**
      **An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (CLOs 1, 2, 5, 6)**
      **An ability to communicate effectively with a range of audiences (CLOs 3, 4, 5, 6)**
      **An ability to acquire and apply new knowledge as needed, using appropriate learning strategies (CLOs 5, 6)**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Strategies for computational problem solving**
   - **Algorithm efficiency analysis (review)**
   - **Arguing program correctness**
   - **Working with arrays (review and some advanced problems)**
   - **Primitive data types (review and some advanced problems)**
   - **String and text manipulation**
   - **Student presentations of programming techniques/tips**
   - **Searching and sorting (review and some advanced problems)**
   - **Trees (review and some advanced problems)**
   - **Dynamic Programming**
   - **Course project: Design, implement, and analyze a computational solution to an everyday problem**

Prepared by: Stefan Christov
Creation date: 06/29/2021
Revised:

1. Course number and name
   **SER 360, Software Engineering in Healthcare**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Stefan Christov**

4. Text book, title, author, and year
   **Biomedical Informatics: Computer Applications in Health Care and Biomedicine, Edward Shortliffe and James Cimino, 2014**

   a. Other supplemental materials

5. Specific course information

   a. Catalog description of the content of the course
      **Biomedical informatics is one of the fastest growing economic sectors in the world. Software, and thus software engineering, has an important role in biomedical informatics. Students in this course explore the applicability of software engineering techniques to healthcare. Topics include electronic health records; modeling and analysis of medical processes with the goal of improving safety and efficiency; software solutions for providing clinical decision support; and bioinformatics.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215, SER225 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Objectives (the student will be able to):**
      - **Describe the major challenges and issues in the field of biomedical informatics and the role of software engineering in addressing them**
      - **Analyze electronic health records with respect to core functionalities they need to provide**
      - **Model medical processes using a notation with well-defined semantics**
      - **Apply software engineering approaches to analyze medical processes to improve their safety and efficiency**
      - **Design and implement a simple clinical decision support system**
      - **Describe bioinformatics and apply basic computational techniques utilized in that field**
      - **Describe potential future directions for integrating software engineering in healthcare**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **Other outcomes addressed:**
      **An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (CLOs 1-6)**

**An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors (CLO 5)**
**An ability to communicate effectively with a range of audiences (CLOs 1, 5, 7)**
**An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives (CLO 5)**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Role of computing in health care**
   - **Electronic health records**
   - **Medical errors and processes as software**
   - **Process modeling**
   - **Property specification**
   - **Applying model checking to verify properties of medical processes**
   - **Fault tree analysis**
   - **Clinical decision support**
   - **Bioinformatics and sequence analysis**
   - **Student presentations of a topic related to the role of computing in health care**
   - **Course project: in collaboration with nursing students and professors, specify, design, implement, and evaluate a software system for documenting a cardiac arrest**

Prepared by: Stefan Christov
Creation date: 06/29/2021
Revised:

1. Course number and name
   **CSC375, Machine Learning**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Prof. Emre Tokgoz**

4. Text book, title, author, and year
   **Deep Learning with PyTorch by Eli Stevens, Luca Antiga, and Thomas Viehmann, Manning Publications, 2020. ISBN 9781617295263**

   a. Other supplemental materials
      **Supplemental material provided on Blackboard**

5. Specific course information

   a. Catalog description of the content of the course
      **General Catalog Description: This course explores advanced computer science topics not available in other courses, as well as new topics as they emerge in this rapidly evolving discipline. Topics may be interdisciplinary.**

      **Specific Course Description: Students are initially introduced to the fundamentals of Python programming. Machine Learning concepts are covered by using Jupyter Notebook and Python with emphasis given to the use of PyTorch library with applications. Students are expected to work in groups to explain theoretical Machine Learning concepts with real-life applications and strategize and solve problems. Participants are also introduced to basic bioinformatics concepts by using Biopython. Healthcare applications are emphasized throughout the course. The completion of a real-life semester project in groups is an essential component of grading and participation.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215 and SER225 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Outcomes (the student will be able to):**

      **i. Apply Python programming language in healthcare.**
      **ii. Function effectively in teams to explain theoretical machine learning concepts.**
      **iii. Use Machine Learning for meaningful data analysis.**
      **iv. Fulfill ethical and professional responsibilities by working in groups on projects.**
      **v. Use PyTorch for Machine Learning image analysis.**
      **vi. Design software solutions by using Python.**
      **vii. Complete a real-life project by working in groups and applying machine learning concepts.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C1, C2, C3, C4, C5, C6**

7. Brief list of topics to be covered
   **Lecture Topics**

- **Software Fundamentals**
- **Machine Learning Fundamentals using Jupyter Notebook**
- **Coverage of Machine Learning techniques and fundamental theoretical knowledge needed to cover Deep Learning with PyTorch**
- **Team Presentations of Book Chapters**
- **Introduction to Biopython and Fundamentals of Bioinformatics**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised: Jonathan Blake (06/28/2021)

1. Course number and name
   **CSC375, Cloud Computing**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Solomon Abiola (Prof. Jonathan Blake)**

4. Text book, title, author, and year
   **N/A (Online resources will be used)**

   a. Other supplemental materials
      **Supplemental material provided on Blackboard**

5. Specific course information

   a. Catalog description of the content of the course
      **General Catalog Description: This course explores advanced computer science topics not available in other courses, as well as new topics as they emerge in this rapidly evolving discipline. Topics may be interdisciplinary.**

      **Specific Course Description: This introductory 3 credit course provides a hands-on approach to cloud computing. Through this course students will be exposed to a wide variety of cloud computing providers, concepts, and projects. This course will specifically cover in detail Google's Cloud Platform and Amazon's Web Services. At the completion of this course students will be familiar with key cloud concepts. Will develop their own cloud project and be prepared to sit for one of the cloud certification exams on either cloud platform.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215 and SER225 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **None listed in syllabus**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Overview of Cloud Computing**
   - **Cloud Service Models – IaaS, PaaS, SaaS**
   - **Cloud Computing Components – Virtual Machines, Servers,**
   - **Cloud Computing Services**
   - **Infrastructure – Availability Zones, Regions, Edge Locations**
   - **Hands On – Exploring the various main services in GCP/AWS**
   - **Pricing and Billing in GCP/AWS**
   - **Security in the Cloud**

- **Databases and Networking in the Cloud**
- **Big Data and Machine Learning in the Cloud**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised: Jonathan Blake (06/28/2021)

1. Course number and name
   **CSC375, Advanced Database Programming**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Prof. Dennis Klemenz**

4. Text book, title, author, and year
   **No required textbook**

   a. Other supplemental materials
      **Recommended books:**

      **SQL The Complete Reference, Weinerg, Third Edition. McGraw-Hill**
      **SQL Cookbook, Molinaro, First Edition. O'Reilly**
      **SQL For Smarties, Celko, Fifth Edition. Morgan Kaufman. (Book series)**

5. Specific course information

   a. Catalog description of the content of the course
      **General Catalog Description: This course explores advanced computer science topics not available in other courses, as well as new topics as they emerge in this rapidly evolving discipline. Topics may be interdisciplinary.**

      **Specific Course Description: Not available**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215 and SER225 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Outcomes (the student will know):**

      **i. The basic terminology of relational databases**
      **ii. How to write meaningful, accurate, formatted and optimized SQL code**
      **iii. How to CRUD (create, retrieve, update and delete) data**
      **iv. How a DBMS interprets SQL code**
      **v. How to optimize SQL code**
      **vi. How to create a SQL script, procedures, triggers and custom aggregation functions**
      **vii. How to visualize data**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **None**

7. Brief list of topics to be covered
   **Not provided**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised: Jonathan Blake (06/28/2021)

1. Course number and name
   **CSC399, Systems Programming**

2. Credits and contact hours
   **3**

3. Instructor's or course coordinator's name
   **Christian Duncan**

4. Text book, title, author, and year
   ***A Practical Guide to Ubuntu Linux (3rd Edition)*, by Mark Sobel.**

   a. Other supplemental materials
      **None. (Instructor will work with student to identify a good C programming book or online source based on their experience.)**

5. Specific course information

   a. Catalog description of the content of the course
      **The purpose of this course is to provide the students with an introduction to system-level programming. Although not the primary focus of this course, instruction shall be done within the context of C and Linux/FreeBSD.**

   b. prerequisites or co-requisites
      **Prerequisites: CSC215, SER225 (Minimum Grade C-)**

   c. indicate whether a required, elective, or selected elective
      **Selected elective**

6. Specific goals for the course

   (a) specific outcomes of instruction
      **Course Learning Outcomes (the student will be able to):**

      **1. To work effectively in a UNIX-style environment.**
      **2. To explain the basic operations that are performed from the time a computer is turned on until a user is able to execute programs.**
      **3. To write medium to large C programs for a range of applications.**
      **4. To use systems tools for C programming.**
      **5. To write C programs that use the UNIX system call interface.**
      **6. To write small to medium size scripts, in various scripting languages, for a range of applications.**

   (b) explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      **C2 (CLO 3, 4, 5, 6), C6 (CLO 3, 4, 5, 6)**

7. Brief list of topics to be covered
   **Lecture Topics**

   - **Using standard Linux desktop user environments, file systems, and tools.**
   - **Using the command line to interact with the Linux Operating system.**
   - **Using advanced shell commands such as piping, I/O redirects, and variable substitution.**
   - **Writing programs in a scripting language (Bash).**
   - **Writing programs in the C programming language, including using pointers and memory management.**

- **Using standard C libraries for various programming tasks.**
- **Using various tools to enhance programming, such as makefiles, profilers, lint, and debuggers.**
- **Examining what happens during program compilation, linking, and loading.**
- **Interacting directly with the operating system by making system calls for file management, file execution, process control, and interprocess communication.**
- **Main project: Implement a simple interactive shell (similar to Bash or TCSH)**

Prepared by: Christian Duncan
Creation date: 06/28/2021
Revised: