

# Civil & Applied Mechanics Engineering Courses

## **CE 240 - Engineering Statics (3)**

*Prerequisite: PHYS 220A/L. Corequisite: MATH 250.*

Analysis of the distribution of forces on and within bodies in static equilibrium. Free body diagrams, equilibrium equations and the method of sections. Includes a limited introduction to the subject of strength of materials. (Design units:0)

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# Computer Science Courses

## **COMP 110/L Introduction to Algorithms and Programming (3/1)**

*Prerequisites: Grade of C or better in MATH 102, 103, 104, 105, 150A or 255A, or a passing score on the Math Placement Test (MPT) that satisfies prerequisites for MATH 150A or 255A. Corequisite: Comp 110L.*

Introduction to algorithms, their representation, design, structuring, analysis and optimization. Implementation of algorithms as structured programs in a high level language. Lab: three hours per week.

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## **COMP 122/L Computer Architecture and Assembly Language (1/1)**

*Prerequisites: Grade of C or better in COMP 110/L; Grade of C or better in MATH 103, 104, 105, 150A or 255A, or a passing score on the Math Placement Test (MPT) that satisfies prerequisites for MATH 150A or 255A; Lower Division writing requirement. Corequisite: Comp 122L.*

Introduction to computer architecture, assembly language programming, system software and computer applications. Number systems and data representation. Internal organization of a computer. Primitive instructions and operations. Assembly language. Integrated lecture/lab environment. Lab: 3 hours per week.

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## **COMP 182/L Data Structures and Program Design (3/1)**

*Prerequisites: Grade of C or better in COMP 110/L; Grade of C or better in MATH 103, 104, 105, 150A or 255A, or a passing score on the Math Placement Test (MPT) that satisfies prerequisites for MATH 150A or 255A; Lower Division writing requirement. Corequisite: COMP 182L.*

Introduction to data structures and the algorithms that use them. Review of composite data types, such as arrays, records, strings and sets. Role of the abstract data type in program design. Definition, implementation, and application of data structures such as stacks, queues, linked lists, trees and graphs. Recursion. Use of time complexity expressions in evaluating algorithms. Lab: 3 per week.

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### **COMP 222 Computer Organization (3)**

*Prerequisites: Comp 122/L, 182/L.*

Extension of basic addressing concepts to more advanced addressability such as base register and self-relative addressing. Comparative computer architecture focusing on such organizations as multiple register processors and stack machines. Basics of virtual memory input-output. Introduction to the concept of microprogrammable systems. Low level language translation process associated with assemblers. System functions such as relocatable loading and memory management. Application of data structure and hashing techniques to the above. Other related topics.

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### **COMP 282 Advanced Data Structures (3)**

*Prerequisites: Grade of C or better in COMP 182/L and MATH 150A.*

Introduction to advanced data structures (particularly persistent structures) using object-oriented design. Main memory structures, hash tables and trees. Architectural foundations for files. Large-scale sorting. Hash-based persistent structures. Indexed files. Introduction to databases.

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### **COMP 322/L Introduction to Operating Systems and System Architecture and Laboratory (3/1)**

*Prerequisites: Comp 222, and 282.*

Recommended Corequisite: Comp 322L; 105C or knowledge of “C” Language. Examination of the principal types of systems including batch, multi-programming, and time-sharing. Networked systems are also discussed. The salient problems associated with implementing systems are considered including interrupt of event driven systems, multi-tasking, storage and data base management, and input-output. Emphasis will be placed on some of the simple algorithms used to solve common problems encountered such as deadlocks, queue service, and multiple access to data. Projects will be implemented to reinforce the lectures. One 3-hour lab per week.

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### **COMP 380/L Introduction to Software Engineering (2/1)**

*Prerequisites: COMP 270/L or 282. Corequisite: COMP 380L.*

Concepts and techniques for systems engineering, requirements analysis, design, implementation and testing of large-scale computer systems. Principles of software engineering for production of reliable, maintainable and portable software products. Emphasis on object-oriented analysis and design techniques. Topics include unit, integration and systems testing, configuration management, software quality assurance practices and an introduction to Computer Aided Software Engineering (CASE). This is a lecture portion of a course in software engineering involving the design and partial implementation of a software system as a group project. Lab: 3 hours per week.

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### **COMP 420 Advanced Operating System Concepts (3)**

*Prerequisites: COMP 322/L; Attempted Upper Division Writing Proficiency Exam.*

In-depth discussion of selected issues related to the study of operating systems. Areas of coverage may include concurrency issues, resource allocation, storage management and multiprocessor environments. Discusses underlining theory and algorithms related to the issues.

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### **COMP 424 Computer System Security (3)**

*Prerequisites: COMP 322/L or 380/L, or CIT 360 and IS 435; Attempt Upper Division Writing Proficiency Exam.*

Analysis of the need for computer system security and the security techniques in operating systems, databases and computer networks. Supporting techniques, such as auditing, risk analysis and cost-benefit tradeoffs, are discussed.

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### **COMP 426 Fault-Tolerant Software and Computing (3)**

*Prerequisites: COMP 322/L, 380/L; Attempted Upper Division Writing Proficiency Exam.*

Examination of dependability requirements in computing and the basic principles of system-level reliability and fault-tolerance. Software-based implementation of fault-tolerance in distributed systems. Fault-tolerant software and data bases: reliability modeling, fault-tolerance techniques (e.g., recovery blocks, N-version programming) and design approaches.

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### **COMP 429 Computer Network Software (3)**

*Prerequisites: Comp 322/L; attempted upper-division writing exam.*

Basic software design and analysis considerations in networking computers into coherent, cooperating systems capable of processing computational tasks in a distributed manner. Network topology, routing procedures, message multiplexing and process scheduling techniques.

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### **COMP 432 Object-Oriented Programming (3)**

*Prerequisites: COMP 322/L; Attempted Upper Division Writing Proficiency Exam.*

Principles of object-oriented design and programming; object-oriented languages such as Simula, C++ and Smalltalk are compared to provide an understanding of the role of objects, methods, message passing, encapsulation, classes, inheritance and instance variables in a productive programming environment. Discusses language design and programming issues.

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### **COMP 440. Database Design (3)**

*Prerequisites: COMP 380/L; Attempted Upper Division Writing Proficiency Exam.*

Database structure, including: structure definition, data models, semantics of relations and operation on data models. Database schemas, including element definition and use and manipulation of the schema. Elements of implementation. Algebra of relations on a database.

Hierarchical databases. Discussion of information retrieval, reliability, protection and integrity of databases.

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**COMP 469. Introduction to Artificial Intelligence (3)**

*Prerequisites: COMP 310, 380/L, 410; Attempted Upper Division Writing Proficiency Exam.*

Exploration of the use of computers to perform computations normally associated with intelligence. These include game playing, theorem proving, problem solving, question answering and visual perception. Topics include languages, system architectures and heuristic strategies for advanced, high-level computations. Covers computational models for knowledge representation, natural language and vision.

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**COMP 484/L. Web Engineering I and Lab (2/1)**

*Prerequisites: COMP 322/L or 380/L, or CIT 360 and IS 451; Attempted Upper Division Writing Proficiency Exam. Corequisite: COMP 484L.*

Internet infrastructure and the underlying networking technologies. Study of system and software architectures for web applications, e-business and e-commerce systems. Principles of website design. Advances in web-engineering technologies. Principles of web-based transaction processing. XML and the associated technologies. Web service technology. Security and privacy issues. Study of the emerging Internet technologies. Lab: three hours per week.

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**COMP 485. Human-Computer Interaction (3)**

*Prerequisites: COMP 380/L, or CIT 360 and IS 451; Attempted Upper Division Writing Proficiency Exam.*

Examines the information exchange between humans and computer systems. Discusses aspects of input/output devices, software engineering and human factors with respect to human-computer interactions. Topics include text and graphic display; user modeling; program design, debugging, complexity and comprehension; and current research studies and methodologies.

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**COMP 529 Advanced Network Topics (3)**

*Prerequisite: Comp 429; MATH 340 or 441.*

Advanced course on design and analysis of high-speed networks (Broadband ISDN and Asynchronous Transfer Mode (ATM) networks) and their protocols. Topics include: multimedia services integrating techniques including synchronous and asynchronous ATM network traffic control, ATM experimental networks, high-speed LAN/MANs, internetworking with high-speed networks, and simulation techniques.

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### **COMP 541. Data Mining (3)**

*Prerequisite: COMP 380/L. A study of the concepts, principles, techniques and applications of data mining.*

Topics include data preprocessing, the ChiMerge algorithm, data warehousing, OLAP technology, the Apriori algorithm for mining frequent patterns, classification methods (such as decision tree induction, Bayesian classification, neural networks, support vector machines and genetic algorithms), clustering methods (such as k-means algorithm, hierarchical clustering methods and self-organizing feature map) and data mining applications (such as Web, finance, telecommunication, biology, medicine, science and engineering). Privacy protection and information security in data mining are also discussed.

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### **COMP 560. Expert Systems (3)**

*Prerequisite: COMP 469.*

Extensive introduction to the concepts and techniques of expert systems. Rationale for such systems, including evaluation of prospective domains. Explores existing systems, those under development and likely future areas. Basic architecture is demonstrated using both example and rule-based systems. Commercial tools for building expert systems are surveyed and evaluated. Knowledge acquisition methods. Guidelines given for planning and managing development projects.

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### **COMP 565/L. Advanced Computer Graphics (2/1)**

*Prerequisite: COMP 322/L.*

This course will cover the theory, design, implementation and application of advanced computer graphics environments. Accelerated 3D graphics APIs; the modeling and simulation of light, sound, physical objects, motion and collisions; and user interaction in single- and multi-user virtual environments will be studied. The application domain for this class is interactive 3D computer games, scientific visualization and virtual reality.

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### **COMP 581 Open Source Software Engineering (3)**

*Prerequisites: COMP 380/L.*

Introduction to open source software engineering concepts, principles and applications. Topics include history of open source software, open source software engineering models, open source products and software quality, strategies and business models, government policies toward open source software, work organization of open source software development, software and intellectual property rights, organizations of the open source community, and case studies. Different open source software products for various applications are also discussed and used for group projects.

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### **COMP 587 Software Verification and Validation (3)**

*Prerequisites: COMP 380/L; Passing score on the Upper Division Writing Proficiency Exam.*

An-in depth study of verification and validation strategies and techniques as they apply to the development of quality software. Topics include test planning and management, testing tools, technical reviews, formal methods and the economics of software testing. The relationship of testing to other quality assurance activities as well as the integration of verification and validation into the overall software development process are also discussed.

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### **COMP 598EA – Embedded Application (3)**

*Prerequisites: COMP 380/L.*

Embedded systems present cost effective, challenging and flexible computational platforms. Students will be instructed in the unique aspects of embedded systems including architectures, instruction sets, development environments, concurrent programming, networking, applications of embedded platforms, data acquisition from sensors and interaction with physical environments.

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### **COMP 598NSP – Advanced Network Security Projects**

*Prerequisites: COMP 424 or Comp429.*

Topics regarding the implementation and administration of network and information infrastructure components will be presented. Issues covered include security administration, packet filtering, proxy services and virus protection. Fundamentals of administering information services such as SMTP, DNS, LDAP and HTTP will be investigated. Internet infrastructure administration and routing protocols such as RIP, BGP and link redundancy will also be explored.

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### **COMP 686. Software Engineering Management (3)**

*Prerequisites: COMP 380/L; Upper Division Writing Proficiency Exam.*

Provides a framework for understanding software engineering management models, technologies, trends, tools and planning processes. Emphasizes the development of an individualized approach to managing software teams, projects and systems. The role of management as an increasingly critical factor in software engineering.

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### **COMP 699C Independent Study (3)**

# Manufacturing System Engineering & Management Courses

## **MSE 227 Engineering Materials (3)**

*Prerequisites: CHEM 101, PHYS 220A/L. Corequisite: MATH 150B.*

An introductory course in engineering materials including metals, ceramics, polymers and composites. Study of atomic and crystalline structures of materials. Application of basic principles to study of mechanical, physical, and chemical behavior of materials. Selection of materials in engineering applications based on above criteria. Design project on materials properties, selection, or application. Three hours lecture per week. (Design units: 0.25)

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## **MSE 227L Engineering Materials Lab (1)**

*Prerequisites: CHEM 101, PHYS 220A/L; MATH 150A Corequisite: MATH 150B; MSE 227.*

An introductory lab course on engineering materials and their properties. Includes experiments in mechanical properties, heat treatment, metallography, corrosion properties and X-ray diffraction. Course culminates in a special project where students identify, design, and perform an experiment of their choosing. One 3-hour lab per week. (Design units: 0.25)

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## **MSE 304 Engineering Economic Analysis (3)**

*Prerequisite: MATH 150B.*

The systematic evaluation of the economic benefits and costs of projects involving engineering design and analysis. Economic decision-making in an environment of limited resources and uncertainty. Present economy, the economy of multi-year projects, selection among competing alternatives, sensitivity of outcomes to input parameters, before-and after-tax analysis, replacement economy, inflation, and breakeven analysis in production environments are discussed. (Design units: 0.5)

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# Mechanical Engineering Courses

## **ME 309 Numerical Analysis of Engineering Systems (2)**

*Prerequisites: MATH 150B; ME 286B/L or COMP 106/L or ECE 206.*

Features engineering problems which require the use of algorithms and numerical analysis to obtain a solution. Modern tools such as spreadsheets with imbedded high level languages are used for analysis and code development. Program documentation which requires extensive use of computer-based technical writing skills with graphical presentation. A cross section of

problems are selected from various branches of engineering. Two 3-hour laboratories each week.

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**ME 370 Thermodynamics (3)**

*Prerequisite: MATH 250; PHYS 220A/L.*

Fundamental theories and engineering applications of thermodynamics with emphasis of first and second laws of thermodynamics. The thermodynamic properties of solids, liquids, gases, and mixtures. Work-producing and work-absorbing systems. Applications to design.

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**ME 375 Heat Transfer I (3)**

*Prerequisite: MATH 250; PHYS 2250A/L.*

Basic principles of heat transfer and their application. Introduction to conductive, convective, and radiative heat transfer. Applications to design.

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## Biology Courses

**BIOL 106/L Biological Principles I and Lab (3/1)**

*Corequisite: BIOL 106L*

Primarily for Biology Majors. Half of a two-semester sequence that includes BIOL 107/L. Selected topics illustrating major concepts in biology, including the scientific process, heredity, evolution, taxonomy and systematics, ecology, and animal behavior. Observations, experiments and demonstrations. Emphasis on unifying biological concepts and methods in science. Available for General Education, Natural Sciences, if required in student's major. Lecture 3 hours and 3 hours laboratory per week.

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**BIOL 107/L Biological Principles II and Lab (3/1)**

*Corequisite: BIOL 107L Recommended Corequisite or Preparatory: CHEM 102/L.*

Half of a two-semester sequence that includes BIOL 106/L. Selected topics illustrating major concepts in biology, including the scientific process, heredity, evolution, taxonomy and systematics, ecology, and animal behavior. Observations, experiments and demonstrations. Emphasis on unifying biological concepts and methods in science. Available for General Education, Natural Sciences, if required in student's major. Lecture 3 hours and 3 hours laboratory per week.



## Chemistry Courses

### **CHEM 101/L General Chemistry I and Lab (4/1)**

*Prerequisite: Satisfactory score on the Chemistry Placement Test (CPT) or a grade of C or higher (C- is unacceptable) in CHEM 100 taken at CSUN only. Corequisite: CHEM 101L.*

Basic course in the fundamental principles and theories with special emphasis on chemical calculations. It includes a discussion of the kinetic molecular theory, atomic structures, the periodic table, solutions and oxidation-reduction. Recitation portion deals with problem solving, review of the lecture material and quizzes. Lab section emphasizes basic lab skills, quantitative relationships in chemistry and inorganic preparative procedures. Completion of CHEM 101/L satisfies General Education Natural Sciences, including the corresponding lab requirement. 3 hours of lecture; 1 hour recitation per week; one 3-hour lab per week.

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### **CHEM 102/L General Chemistry II and Lab (4/1)**

*Prerequisite: CHEM 101/L with a minimum grade of C- in CHEM 101. Corequisite: CHEM 102L.*

Continuation of CHEM 101. Introduction to kinetics, gas phase and solution equilibria, electrochemistry, chemical thermodynamics, radio, organic chemistry and descriptive chemistry of the more familiar metals and nonmetals. Recitation portion deals with problem solving, review of the lecture material and quizzes. Lab section consists of experiments dealing with kinetics, acid-base and solubility equilibria, selected reactions of metals and nonmetals, and qualitative elemental analysis. Completion of CHEM 102/L satisfies General Education, Natural Sciences, including the corresponding lab requirement. 3 hours lecture; 1 hour recitation per week; one 3-hour lab per week.

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## Math Courses

### **MATH 150A Mathematical Analysis I (5)**

*Prerequisite: Passing score on or exemption from the Entry Level Mathematics Examination or credit in MATH 093, and either a passing score on the Mathematics Placement Test or completion of MATH 105, or both MATH 102 and 104, at CSUN with grades of C or better. Students who transfer the equivalent of MATH 105, or both MATH 102 and 104, with a C or better are required to achieve a passing score on the Math Placement Test.*

Limits, derivatives, applications of differentiation. Definite and indefinite integrals, the Fundamental Theorem of Calculus. (Available for General Education, Basic Subjects Section A.3)

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**MATH 150B Mathematical Analysis II (5)**

*Prerequisite: MATH 150A with a grade of C or better.*

Techniques of integration, numerical integration, improper integrals, applications of the integral. Taylor polynomials, sequences and series, power series.

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**MATH 250 Mathematical Analysis III (3)**

*Prerequisite: Completion of Math. 150B with a grade of C or better.*

A continuation of Mathematics 150B. Solid analytic geometry, partial differentiation, and multiple integrals with applications.

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**MATH 280 Applied Differential Equations (3)**

*Prerequisite: MATH 150B Recommended Corequisite or Preparatory: MATH 250.*

Ordinary differential equations, systems of equations, series solution, Laplace transforms, with emphasis on applications. This course is not open to students who have credit for Math 351.

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**MATH 262 Introduction to Linear Algebra (3)**

*Prerequisite: MATH 150B.*

Systems of linear equations, matrices, determinants, eigenvalues, vector spaces, linear transformations, introduction to inner products on  $\mathbb{R}^n$ , spectral theorem for symmetric matrices.

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**MATH 326 Discrete Mathematics (3)**

**Prerequisites: MATH 150B and PHIL 230.**

Propositional calculus, predicate calculus, set algebra, relations, functions, mappings, fields, number systems.

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## Physics Courses

**PHYS 220A Mechanics (3)**

*Prerequisite: MATH 150A. Recommended Corequisite or Preparatory: MATH 150B.*

Dynamics and statics of particles and rigid bodies, harmonic vibrations, and fluid mechanics. (Available for General Education, Section B.1, Natural Sciences.)

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**PHYS 220AL Mechanics (1)**

*Recommended Corequisite or Preparatory: PHYS 220A or 225.*

May be used to satisfy the lab requirement in Natural Sciences, General Education, Section B.1, provided PHYS 220A is also completed.

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**PHYS 220B Electricity and Magnetism (3)**

*Prerequisite: Physics 220A; MATH 150B Corequisite Mathematics 250.*

Electric and magnetic fields, circuit theory and electromagnetic induction. (Available for General Education, Section B.1, Natural Sciences.)

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**PHYS 220BL Electricity and Magnetism Lab (1)**

*Recommended Corequisite or Preparatory: PHYS 220B or 226.*

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**PHYS 227 University Physics III (4)**

*Prerequisite: PHYS 226 or 220B, and MATH 250. Recommended Corequisite or Preparatory: Math 280.*

3<sup>rd</sup> course of a sequence of courses intended primarily for physical science majors. Calculus based course on Thermodynamics, Waves and Modern Physics.

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**PHYS 227L University Physics III Lab (1)**

*Recommended Corequisite or Preparatory: PHYS 227*

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**PHYS 375 Quantum Physics I (3)**

*Preparatory: MATH 262; PHYS 301.*

Classical background, the wave function, Schroedinger equation, time development and stationary states, 1-deimensional problems, harmonic oscillator and formalism of quantum mechanics.

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