CME 310 Chemical Engineering Laboratory II: Chemical and Molecular Engineering
Introduction and operation of a continuous unit, handling of air-sensitive/water-sensitive materials, solvation and thermal techniques for materials synthesis, preparation of polymer nano-composites and nano-sized materials.
Prerequisite: CME 310
3 credits

CME 322 Chemical Engineering Heat and Mass Transfer
Heat transfer by conduction, principles of heat flow in fluids with and without phase change, heat transfer by radiation, heat exchange equipment. Principles and theory of diffusion, mass transfer between phases, distillation, leaching and extraction, fixed-bed membrane separation, crystallization.
Prerequisite: CME 318
3 credits

CME 323 Reaction Engineering and Chemical Kinetics
Prerequisites: CME major; U3 standing; CME 312 and 314
3 credits

CME 327 Molecular Modeling for Chemical Engineers
Molecular modeling techniques and simulation of complex chemical processes. Use of Monte Carlo methods and Molecular Dynamics methods. Emphasis on the simulation and modeling of biopolymeric systems.
Prerequisites: PHY 132; ESG 111 or MEC 112; AMS 261 or MAT 203; AMS 361 or MAT 303
3 credits

CME 371 Biomedical Polymers
This course focuses on the clinical performance of polymers and discusses the chemical, physical, mechanical and biological questions raised by the unique use of these materials within the human body. The chemistry and properties of key biomedical polymers will be studied and their biomedical applications will be discussed. The biomaternal's response to the various components of its biological environment will be examined, followed by the response of the host to the presence of the implanted polymer. Special attention will be given to the interaction of the system with two fundamental phenomena: the Foreign Body Response and the Coagulation Cascade. Applications of bio-polymers to tissue engineering and the relevance of nanoscale phenomena are discussed.
Pre- or Corequisite: CHE 321 or permission by the instructor.
3 credits

CME 401 Separation Technologies I
Fundamentals of separations. Introduction to standard classical and advanced separation methods and their relative merits and limitations. Distillation, crystallization, filtration, centrifugation, absorption and stripping methods. Includes fundamentals of chromatography.
Prerequisites: CME major; U3 or U4 standing; CME 320
3 credits

CME 402 Separation Technologies II
Prerequisite: CME 401
3 credits

CME 410 Chemical Engineering Laboratory III: Instrumentation, Material Design and Characterization
Synthesis of unsupported nanosized metal and nano-sized metal in a polymer. Characterization of synthesized nanomaterials by modern spectroscopic techniques (TEM, XRD, FTIR, and XPS). Data analysis and interpretation.
Prerequisite: CME 320
3 credits

CME 420 Chemical Engineering Laboratory IV: Directed Research
Directed laboratory research or internship in industry. Includes original research project selection and a formal report preparation.
Prerequisite: CME 410
2 credits

CME 440 Process Engineering and Design I
Classical methods of chemical process engineering, advanced mathematical techniques and computer software for efficient and accurate process design and development. Mini-project design.
3 credits

CME 441 Process Engineering and Design II
Major design project: a review of engineering design principles; engineering economics; economic evaluation, capital cost estimation; process optimization; profitability analysis for efficient and accurate process design.
Prerequisites: CME 401 and 440
3 credits

CME 470 Polymer Synthesis: Theory and Practice, Fundamentals, Methods, Experiments
This course teaches general methods and processes for the synthesis, modification, and characterization of macromolecules. It includes general techniques for purification, preparation and storage of monomers; general synthetic methods such as bulk, solution, and heterogeneous polymerization; addition and condensation polymerization; methods of separation and analysis of polymers.
Prerequisites: PHY 132, PHY 134, CHE 322
3 credits

CME 488 Industrial Internship in Chemical Engineering
Research project in an industrial setting under joint supervision of an industrial mentor and chemical engineering faculty. Project to cover some or all of the following chemical engineering principles of product synthesis: experiment design, data collection, data analysis, process simulations, and report writing related to an actual production facility. May be repeated up to a maximum of 12 credits.
Prerequisites: B average in CME courses; permission of supervising faculty member
0-12 credits

CME 499 Research in Chemical Engineering
Independent research project under the supervision of a chemical engineering or interdisciplinary faculty member. Project to cover some or all of the following chemical engineering principles: experiment design, data collection, date analysis, process simulations, and report writing. May be repeated but a maximum of 3 credits of research electives can be counted towards technical elective requirements.
Prerequisites: B average in CME courses; permission of supervising faculty member
0-3 credits

CSE 101 Introduction to Computers and Information Technologies
An introduction to the basics of personal computing and information technologies intended primarily for students majoring in humanities, social and behavioral sciences, or business management. Topics include principles of personal (single-user) computer systems, office automation, and information in a modern, networked (multi-user) computing environment. Emphasis is on conceptual understanding of personal computing rather than use of specific hardware or software. Required participation in computer laboratories. May not be taken for credit in addition to EST 100 or after any CSE or ISE course.
Prerequisite: Satisfaction of entry skill in mathematics requirement (Skill 1) or satisfactory completion of D.E.C. C
3 credits

CSE 102 Introduction to Web Design and Programming
An introduction to the design of Web pages, specifically the development of browser and device independent HTML, with an emphasis on the XHTML standards. Includes the use of style sheets (CSS) and tools for page layout and verification. HTML is presented as a mark-up language, exploring the rules of HTML elements and attributes. Students learn the separation of page viewing information from the HTML through CSS style sheets as well as the use of block layout without using HTML tables. Addresses HTML display properties including text, color, image, and graphic elements as well as approaches to HTML validation and techniques.
Advisory Prerequisite: CSE 101 or basic computer skills
3 credits

CSE 110 Introduction to Computer Science
An introduction to fundamentals of computer science. Topics covered include algorithmic design, problem-solving techniques for computer programming, fundamentals of digital logic and computer organization, the role of the operating system, introductory programming methodology including variables, assignment statements, control statements and subroutines (methods), programming paradigms, the compilation process, theoretical limits of computation, social and ethical issues. Intended for students who have not taken any college-level computer science course containing programming assignments in a high-level programming language.
Prerequisite: Level 3 or higher on the mathematics placement examination
3 credits

CSE 113-C Foundations of Computer Science I
A rigorous introduction to the conceptual and mathematical foundations of computer science with special emphasis on recursion and its applications in functional programming as well as reasoning techniques based on propositional logic and mathematical induction.
Prerequisite: One MAT course that satisfies D.E.C. category C or score of level 4 on the mathematics placement examination
3 credits

CSE 114 Computer Science I
An introduction to procedural and object-oriented programming methodology. Topics include program structure, conditional and iterative programming, procedures, arrays and records, object classes, encapsulation, information hiding, inheritance, polymorphism, file I/O, and exceptions. Software debugging and testing techniques are emphasized including an introduc-
CSE 220 Computer Organization
Explores the physical structure of a computer; internal representation of information; processor organization, instruction cycle, and memory hierarchy. Introduces assembly/machine language programming and its relation to execution of high level language programs. Elementary digital logic design and its application to design of arithmetic and logic unit, and simple data paths. Input and output devices and their interface with processor and memory.
Prerequisite: CSE 220
3 credits

CSE 230 Intermediate Programming in C and C++
Intermediate programming concepts using the C language in a UNIX environment. Files, systems calls, stream I/O, the C preprocessor, bitwise operations, the use of makefiles, advanced formatting of input and output, conversions. Introduction to object-oriented programming using C++; classes, objects, inheritance, aggregation, and overloading. Suitable for all majors.
Prerequisite: CSE 130 or ESE 124 or ESG 111 or MEC 112
3 credits

CSE 260 Computer Science B: Honors
Second part of a two-semester sequence, CSE 160 and CSE 260. Further development of the object-oriented design strategies presented in CSE 160. Continues with introductions to event-driven programming, graphs, user interfaces, and design patterns. Includes an extended design and programming project.
Prerequisite: CSE 160
3 credits

CSE 300 Writing in Computer Science
See Requirements for the Major in Computer Science, Upper-Division Writing Requirement.
Prerequisites: WRT 102; CSE major; U3 or U4 standing
1 credit

CSE 301-H History of Computing
A study of the history of computational devices from the early ages through the end of the 20th century. Topics include needs for computation in ancient times, development of computational models and devices through the 19th and early 20th centuries, World War II and the development of the first modern computer, and early uses in business. Creation of programming languages and the microchip. Societal changes in computer usage due to the microcomputer, emergence of the Internet, the World Wide Web, and mobile computing. Legal and social impacts of modern computing. Cannot be used as a technical elective for the CSE or ISE major or the CSE minor.
Prerequisite: U2 standing or higher
Advisory Prerequisite: one course in computing
3 credits

CSE 302 Professional Ethics for Computer Science
Familiarizes students with professional practice in Information Technology. Enables them to identify ethical conflicts, their responsibilities and options, and to think through the implications of possible solutions to ethical conflicts.
Prerequisite: CSE 219
1 credit

CSE 303 Introduction to the Theory of Computation
An introduction to the abstract notions encountered in machine computation. Topics include finite automata, regular expressions, and formal languages, with emphasis on regular and context-free grammars. Questions relating to what can and cannot be done by machines are covered by considering various models of computation, including Turing machines, recursive functions, and universal machines.
Prerequisites: CSE 213 and 214
3 credits
CSE 315 Database Transaction Processing Systems
Theory and practice of design for applications involving transactional access to a database. Transaction design, schema design, restart and recovery, journaling, concurrency control, distributed databases. Student groups perform design and implementation of significant database application. This course is offered as both CSE 315 and ISE 315. Prerequisite: CSE/ISE 305
3 credits

CSE 320 Computer Architecture
Covers the detailed physical implementation techniques for floating-point data path, advanced pipeline control, multi-level memory hierarchy, I/O and disk subsystem, architectural support for operating systems and multiprocessing/multicomputer architectures. Prerequisite: CSE 220
3 credits

CSE 325 Computers and Sculpture
This multidisciplinary class surveys how computer science and computer technology are used in sculpture. Case studies with slides, videos, and software demonstrations illustrate a range of approaches of sculptors incorporating computers in their creative process. Various state-of-the-art fabrication technologies are studied (with site visits if available on campus). Mathematical foundations are emphasized so students can recognize them when analyzing sculpture and choose the right tool when designing. In the weekly laboratory, these ideas are reinforced with projects using a range of available software and inexpensive construction materials, e.g., paper, cardboard, and foamcore. Prerequisites: CSE 110 or permission of instructor 3 credits
Prerequisite: CSE 110 or permission of instructor
3 credits

CSE 326 Fundamentals of Digital Image Processing
Covers fundamentals of image transforms, image enhancement, image restoration, image compression, segmentation, representation and description, recognition and interpretation. Prerequisites: CSE 214 or 230; AMS 210 or MAT 211 3 credits

CSE 327 Fundamentals of Computer Vision
Introduces fundamental concepts, algorithms, and techniques in visual information processing, covers image formation, binary image processing, image features, model fitting, optics, illumination, texture, motion, segmentation, and object recognition. Prerequisites: CSE 214 or 230; AMS 210 or MAT 211 3 credits

CSE 328 Fundamentals of Computer Graphics
An introduction to computer graphics including graphics application programming; data structures for graphics; representing and specifying color; fundamental hardware and software concepts for calligraphic and raster displays; two-dimensional, geometric transformations; introduction to three-dimensional graphics; graphics standards; and input devices, interactivity models, and user-computer interface. Prerequisites: CSE 219 and 230; permission of instructor 3 credits

CSE 332 Introduction to Visualization
Visualizion of scientific, engineering, medical, and business data sets. Mechanisms to acquire sampled, computed, or synthetic data and methods to transform symbolic into the visual. Topics include classic visualization process; visual perception; volume and surface visualization; methods for visualizing sampled, simulated, and geometric objects; and visualization systems. Emphasis on applications and case studies. This course is offered as both CSE 332 and ISE 332. Prerequisites: CSE 219, MAT 211 or AMS 210
3 credits

CSE 333 User Interface Development
Survey of user interface systems, including topics such as command language, windowing, multiple input/output devices, architecture of user interface management systems, and tool kits for designing user interfaces. Additional topics may include human factors, standards, or visual languages. Students participate in a project involving the design and implementation of a user interface system. This course is offered as both CSE 333 and ISE 333. Prerequisite: CSE 219
Advisory prerequisite: PSY 103
3 credits

CSE 334 Introduction to Multimedia Systems
Survey of technologies available for user interfaces. Discussion of hypertext; voice, music, and video together with tools and models for capturing, editing, presenting, and combining them. Capabilities and characteristics of a range of peripheral devices including devices based on posture, gesture, head movement, and touch. Case studies of academic and commercial multimedia systems including virtual reality systems. Students participate in laboratory exercises and build a multimedia project. This course is offered as both CSE 334 and ISE 334. Prerequisites: CSE or ISE major; U3 or U4 standing
3 credits

CSE 336 Internet Programming
Introduces the design and development of software for Internet commerce. Topics include extended markup language, servlets, cookies, sessions, Internet media types. Web protocols, digital signatures, certificates, encryption, and the wireless Internet. This course is offered as both CSE 336 and ISE 336. Prerequisite: CSE 219
3 credits

CSE 346 Computer Communications
Basic principles of computer communications. Introduction to performance evaluation of protocols. Protocols covered include those for local, metropolitan, and wide area networks. Introduction to routing, high speed packet switching, circuit switching, and optical data transport. Other topics include TCP/IP, Internet, web server design, network security, and grid computing. Not for credit in addition to CSE/ISE 310. This course is offered as both CSE 346 and ISE 346. Pre- or corequisite for CSE majors: CSE 306 Pre- or corequisite for CSE majors: AMS 310 or 311
Prerequisite for CSE majors: CSE 220
3 credits

CSE 350 Theory of Computation: Honors
Introduces the abstract notions of machine computation for honors students. Includes finite automata, regular expressions, and formal languages, with emphasis on regular and context-free grammars. Explores what can and cannot be computed by considering various models of computation including Turing machines, recursive functions, and universal machines. Prerequisites: CSE 150; CSE Honors Program or Honors College or WISE or permission of instructor
3 credits

CSE 352 Artificial Intelligence
Topics covered include critique of artificial intelligence research; state-space problem representations and search algorithms; game-playing programs; theorem-proving programs; programs for the study and simulation of cognitive processes and pattern recognition. Further topics in current research as time permits. Prerequisites: CSE 219 and 303
3 credits

CSE 355 Computational Geometry
The design and analysis of efficient algorithms to solve geometric problems that arise in computer graphics, robotics, geographical information systems, manufacturing, and optimization. Topics include convex hulls, triangulation, Voronoi diagrams, visibility, intersection, robot motion planning, and arrangement. This course is offered as both AMS 345 and CSE 355. Prerequisite: AMS 301; programming knowledge of C or C++ or Java
2 credits

CSE 364 Advanced Multimedia Techniques
Digital media production techniques for high-bandwidth applications such as electronic magazine illustration, broadcast television, and motion picture special effects. Students explore techniques such as 3D modeling and character animation, video composting, and high-resolution image processing in a state-of-the-art multimedia computing laboratory. High-capacity multimedia storage, high-speed networks, and new technologies such as DVD, HDTV, and broadband will be reviewed. This course is offered as both CSE 364 and ISE 364. Prerequisites: CSE/ISE 334 and permission of the instructor
3 credits

CSE 366 Introduction to Virtual Reality
An introduction to the practical issues in the design and implementation of virtual environments. Topics covered include the fundamentals of systems requirements, transformations, user-interaction models, human vision models, tracking systems, input/output devices and techniques, and augmented reality. The topics covered are explained through the use of real-life applications of virtual-reality systems in engineering, science, and medicine. Prerequisites: CSE 328, CSE/ISE 332, 333
3 credits

CSE 370 Wireless and Mobile Networking
The fundamentals of wireless communication. Link, network and transcript layer protocols for wireless and mobile networking. Cellular networks. Wireless LANs. Wireless mullipop networks. Mobile applications. Prerequisite: CSE 310 or 346
3 credits

CSE 371 Logic
A survey of the logical foundations of mathematics: development of propositional calculus and quantification theory; the notions of a proof and of a model, the completeness theorem, Godel's incompleteness theorem. This course is offered as both CSE 371 and MAT 371. Pre- or Corequisite: MAT 200 or CSE 213
3 credits

CSE 373 Analysis of Algorithms
Mathematical analysis of a variety of computer algorithms including searching, sorting, matrix multiplication, fast Fourier transform, and graph algorithms. Time and space complexity. Upper-bound, lower-bound, and average-case analysis. Introduction to NP completeness. Some machine computation is required for the implementation and comparison of algorithms. This course is offered as both CSE 373 and MAT 373. Pre- or Corequisite: MAT 210 or CSE 210
3 credits

CSE 375 Concurrency
The concurrent execution of asynchronous processes in the abstract using state diagrams and a related language. The concurrent aspects of Java are discussed as a practical implementation of these issues and program logic is introduced to describe them formally. Examples are drawn from operating systems, database systems, and communication systems. Prerequisite: CSE 305 or 306 or ESE 333
3 credits

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COURSE DESCRIPTIONS
CSE 376 Advanced Systems Programming in UNIX/C
Focuses on several aspects of producing commercial-grade system software: reliability, portability, security, and survivability. Uses Unix and C, heavily used in industry when developing systems and embedded systems code. Emphasizes techniques and tools to produce reliable, secure, and highly portable code. Requires substantial programming as well as a course project.
Prerequisite: CSE 214 or 230
3 credits

CSE 377 Introduction to Medical Imaging
An introduction to the mathematical, physical, and computational principles underlying modern medical imaging systems. Covers fundamentals of X-ray computer tomography, ultrasonic imaging, nuclear imaging, and magnetic resonance imaging (MRI), as well as more general concepts required for these, such as linear systems theory and the Fourier transform. Popular techniques for the visualization, segmentation, and analysis of medical image data are discussed, as well as applications of medical imaging, such as image-guided intervention. The course is appropriate for computer science, biomedical engineering, and electrical engineering majors.
Prerequisites: AMS 161 or MAT 211 or 127 or 132 or 142; CSE or ISE major; U3 or U4 standing
DAN 165 (or the former THR 165)
3 credits

CSE 378 Introduction to Robotics
Introduces basic concepts in robotics including coordinate transformation, kinematics, dynamics, Laplace transforms, equations of motion, feedback and feed-forward control, and trajectory planning. Covers simple and complex sensors (such as cameras), hybrid and behavior based control and path planning. Concepts are illustrated through laboratories using the LEGO Robot Kit.
Prerequisites: AMS 161 or MAT 127 or 132 or 142; AMS 210 or MAT 211 or MEC 262
3 credits

CSE 380 Computer Game Programming
An introduction to the fundamental concepts of computer game programming. Students design and develop original games for PCs applying proven game design and software engineering principles.
Prerequisite: CSE 214 or 230
3 credits

CSE 390, 391, 392, 393, 394 Special Topics in Computer Science
A lecture or seminar course on a current topic in computer science. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit as the topic changes, but cannot be used more than twice to satisfy CSE major requirements.
Prerequisites: CSE or ISE major; U3 or U4 standing
3 credits

CSE 408 Network Security
Principles and practices of computer network security. Cryptography, authentication protocols, digital signatures, IP/E-commerce security, VPNs, firewalls, and network intrusion detection.
Prerequisite: CSE/ISE 310 or CSE/ESE 346
3 credits

CSE 409 Computer System Security
Principles and practices of computer system security. Operating system security, authentication and access control, capabilities, information flow, program security, database security, cryptographic key management, auditing, assurance, vulnerability analysis and intrusion detection.
Prerequisite: CSE 306 or 376, or ESE 333
3 credits

CSE 475 Undergraduate Teaching Practicum
Students assist faculty in teaching by conducting a recitation or laboratory section that supplements a lecture course. The student receives regularly scheduled supervision from the faculty instructor. May be used as an open elective only and repeated once.
Prerequisites: U4 standing as an undergraduate major within the college; a minimum g.p.a. of 3.00 in all Stony Brook courses and the grade of B or better in the course in which the student is to assist; or permission of department
3 credits

CSE 487 Research in Computer Science
An independent research project with faculty supervision. Only three credits of research electives (AMS 487, CSE 487, BME 499, ESE 499, ESM 499, ESE 487, and MEC 499) may be counted toward technical elective requirements. May not be taken for more than six credits.
Prerequisites: Permission of instructor and department
0-6 credits

CSE 488 Internship in Computer Science
Participation in local, state, national, or international private enterprise, public agencies, or nonprofit institutions. Students are required to submit a written proposal, progress reports, and a final report on their experience to the client and to the department. May be repeated up to a limit of 12 credits but CSE and ISE 488 cannot be used as electives to satisfy CSE major requirements.
Prerequisites: CSE major, U3 or U4 standing; permission of department
3 credits, S/U grading

CSE 495, 496 Senior Honors Research Project I, II
A two-semester research project carried out under the supervision of a computer science faculty member. Students who enroll in CSE 495 must complete CSE 496 in the subsequent semester and receive only one grade upon completion of the sequence.
Prerequisite: Admission to the Computer Science Honors Program
3 credits

DAN Dance

DAN 102-D Intro to World Dance Cultures
An introduction to the properties and elements of dance in order to understand and appreciate it in a variety of contexts. Dance is considered as art, recreation, social interaction, and entertainment through investigation of societal attitudes, cultural norms, and creative styles of individuals. Formerly offered as THR 102. Not for credit in addition to THR 102.
3 credits

DAN 164-D Tap Technique and History
The fundamentals, technique, and history of tap dance. Basic technique, time step, and combinations are covered. The historical component traces the development of tap from its roots in the music of jazz to present-day expressions. Various traditional styles, individual artists, and current trends are discussed. Formerly offered as THR 164. Not for credit in addition to THR 164.
3 credits

DAN 165-D Contemporary Dance I
The fundamentals, technique, and history of modern dance. Basic principles of alignment, centering, placement, and modern technique are introduced. The historical component includes various styles within the field of modern dance, individual artists who have contributed to the field, and the place of modern dance in society and culture at large. Formerly offered as THR 165. Not for credit in addition to THR 165.
3 credits

DAN 166-D Ballet Technique I
The fundamentals, technique, and history of ballet. The course covers the development of body alignment through stretching and strengthening exercises; simple barre exercises, center floor combinations, and movement phrases to music. The historical component includes the development of ballet from the 15th century to the present day. Various styles, companies, techniques, and individual artists are discussed. Formerly offered as THR 166. Not for credit in addition to THR 166.
3 credits

DAN 167-D Jazz Dance Technique I
The fundamentals, technique, and history of jazz dance. Basic principles of alignment, centering, placement, and jazz technique are covered. The historical component includes various styles within the field of jazz dance, individual artists who have contributed to the field, and the place of jazz dance in society and culture at large. Formerly offered as THR 167. Not for credit in addition to THR 167.
3 credits

DAN 168-D World Dance I
An introduction to dance traditions around the globe. Cultural values, religious beliefs, and social systems are investigated for their influence on the dance. Formerly offered as THR 168. Not for credit in addition to THR 168.
3 credits

DAN 264-D Movement Awareness and Analysis
A course covering the fundamentals of movement, linking theory and techniques from the disciplines of dance and theatre. Using anatomical principles to understand effective use of the skeletal and muscular systems, students are guided, through an interplay of theory and practical work, toward efficient posture and movement habits and test the presence, action, and performance necessary for effective communication and the development of a physical language. Formerly offered as THR 264. Not for credit in addition to THR 284.
3 credits

DAN 353 Special Topics in Dance Performance
A concentration in one aspect of dance. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit as the topic changes. Formerly offered as THR 353. Not for credit in addition to THR 353.
Prerequisites: THR 105; permission of instructor
3 credits

DAN 365 Contemporary Dance II
Further development of modern dance training, devoted to improvement of style, technique, and physical and mental focus. Formerly offered as THR 365. Not for credit in addition to THR 365.
Prerequisite: DAN 165 (or the former THR 165)
3 credits

DAN 366 Ballet Technique II
Further development of ballet training, devoted to improving style, technique, physical and mental focus. Formerly offered as THR 366. Not for credit in addition to THR 366.
Prerequisite: DAN 166 (or the former THR 166)
3 credits