ENGINEERING COURSE DESCRIPTIONS

GENERAL ENGINEERING (ENGR)

101. INTRODUCTION TO ENGINEERING I. (3) Fall. This course provides the incoming freshman with an overview of engineering through a survey of engineering disciplines, discussions of future career opportunities, introduction to computer software for engineering, and guest speakers. In addition, strategies for studying engineering, team-based design and project management will be presented. This class will also provide a forum for discussion of what it is to be a Christian engineer.

220. CIRCUITS I. (4) Fall. Fundamental properties of electrical circuits, basic concepts and circuit elements; analysis methods and network theorems; analysis of transient circuits. Three lecture/three laboratory hours per week. Prerequisite: MATH 201.

221. CIRCUITS II. (4) Spring. Laplace transform techniques for network analysis sinusoidal steady-state response of single and three phase circuits, resonant circuits, linear transformers and magnetic coupling, and introduction to filter design. Three lecture/three laboratory hours per week. Prerequisite: ENGR 220.

310. ENGINEERING ECONOMICS. (3) Spring. Economics from an engineering point of view to be able to make educated decisions in system design, purchasing and engineering management. Topics include supply and demand, the time value of money, and break even analysis, among others. May not be taken for both liberal arts and engineering elective credit.

360. INSTRUMENTATION. (4) Fall. Use and characteristics of transducers for measuring physical variables such as temperature, stress, flow, pressure, and acceleration. Signal conditioning, sampling and processing of measured data. Sources of errors and uncertainty analysis. Statistical concepts, related to measured variables such as regression analysis, failure rate analysis, hypothesis tests, chi-squared goodness-of-fit test, and identification of data outliers. Three lectures/three laboratory hours per week. Prerequisites: PHYS 212, MATH 301, and MATH 351.

401. CONTROL SYSTEMS I. (3) Fall of odd years. System representation via transfer function and state variables, root-locus analysis, bode plot analysis, compensation by root-locus and frequency response methods, state-variable feedback, sensitivity analysis, and tracking using output feedback. Prerequisite: PHYS 211 and ENGR 221.

402. CONTROL SYSTEMS II. (3) Spring of even years. A continuation of CENG 401, emphasizing digital and modern control techniques. Prerequisite: ENGR 401.

420. ENGINEERING DESIGN PROJECT I. (2) Fall. This is the first of a linked two semester sequence that includes ENGR 421. Students must take ENGR 421 in the next sequential semester after earning credit in ENGR 420. Individual and/or team design projects that require creative application of engineering and leading to project design issues relevant to engineering and leading to project design and management decisions will be addressed as students begin developing their capstone projects. One lecture/three laboratory hours per week. Prerequisites: EENG 420 or MENG 420, senior status, and consent of instructor.

421. ENGINEERING DESIGN PROJECT II. (2) Spring. This is the second of a linked, two semester sequence that includes ENGR 420. Students must take ENGR 421 in the next sequential semester after earning credit in ENGR 420. Individual and/or team design projects that require creative application of engineering knowledge. Oral and written presentations are required for this capstone design course that culminates in the completion and presentation of design projects. One lecture/three laboratory hours per week. Prerequisites: ENGR 420 taken the previous semester.

445. ROBOTICS. (3) Methods of analysis, design, and operation of industrial and mobile robots. Kinetic and dynamic models of mechanical manipulators. Electromechanical drive systems. Robotic vision and sensors. Control and optimization of motion trajectories. Control programming. Prerequisites: COMP 268 and EENG 340 or EENG 420.

COMPUTER ENGINEERING (CENG)

150. PROGRAMMING I. (3) Fall, Spring. A course for those with little or no experience in programming. Algorithmic solutions to basic programming problems. Writing of these solutions in C++.

151. PROGRAMMING II. (3) Fall, Spring. A continuation of 150. Concepts covered include multi-dimensional arrays, strings, records, pointers, and files. Prerequisite: COMP 150.

170. SOFTWARE DEVELOPMENT. (5) Fall, Spring. Intended primarily for computing majors. Designing and writing modular program solutions using the C++ programming language. Advanced programming concepts such as multi-dimensional arrays, records, pointers, and files. A math ACT score of 27 or higher is recommended to take this course. Students with less preparation should take COMP 150/151.

245. DATA STRUCTURES. (3) Fall, Spring. Major structures used for storing data on computer systems. Strings, stacks, queues, recursion, linked lists, trees, and graphs. Major searching and sorting algorithms. Analysis of algorithms. Prerequisite: COMP 170 or 150/151.

250. INTERNET DEVELOPMENT. (3) Fall, Spring. Introductory Internet programming including HTML, cascading style sheets, Javascript, CGI programming using C++, applications of applets, XML and other Web development technologies. rerequisite: COMP 170 or 150/151.

268. COMPUTER ARCHITECTURE AND ASSEMBLER PROGRAMMING. (3) Fall, Spring. Machine and assembly language programming with emphasis on computer architecture, data representation, addressing techniques, instruction formats, and logic design. Prerequisite: COMP 170 or 150/151.

301. SOFTWARE ENGINEERING. (3) Fall, Spring. Tools and techniques used in all phases of the systems development lifecycle. Enterprise modeling, data modeling, structured modeling tools, structured design, CASE tools, and prototyping. Development of interpersonal communication skills in group exercises. Prerequisite: COMP 150 or 170.

310. OPERATING SYSTEMS CONCEPTS. (3) Fall. The historical development and current functions of operating systems. Hardware and software requirements for operating systems which support uniprogramming, multiprogramming, and multiprocessing. Process management, memory management, disk scheduling, performance evaluation, security, and case studies. Prerequisites: COMP 245; COMP 268 or EENG 321.

311. DATA COMMUNICATIONS AND NETWORKING. (3) Spring. Network topology, local area networks, wide area networks, layered protocols, network management, and available network hardware and software. Prerequisites: COMP 245; COMP 268 or EENG 321.

328. NUMERICAL METHODS. (3) Spring of even years. Computer solutions to mathematical problems, including systems of linear equations, polynomial interpolation, fixed point algorithms, numerical integration, and numerical solutions to differential equations. Prerequisites: COMP 150 or 170; MATH 251 and MATH 313, or consent of the instructor.

335. FILE STRUCTURES AND ACCESS METHODS. (3) Fall of odd years. Data structures used for the storage of files and methods of access. Sequential files, direct access files, indexed sequential files, hashing, data compaction, data encryption, tree-structured indices, file-processing subroutine libraries, and file support for database systems. Prerequisite: COMP 245.

345. OBJECT-ORIENTED PROGRAMMING. (3) Fall. Object-oriented programming using C++ and/or Java programming language(s). The object paradigm, classes and methods, data abstraction and encapsulation, polymorphism, single and multiple inheritance, memory management, operator and function overloading, templates, and exception handling. Prerequisite: COMP 245.

349. APPLIED ALGORITHMS. (3) Fall of odd years. Classification of algorithms. Complexity and computing requirements, including efficiency, greedy algorithms, divide and conquer algorithms, dynamic programming, graph algorithms, probabilistic algorithms, and computability theory. Prerequisites: COMP 245 and MATH 201.

385. TELECOMMUNICATIONS. (3) Fall. An introductory course in telecommunications. Concepts covered include basic telephony, analog telephones, T1 voice links, voice sampling, quantization, encoding, cellular telephone communications, telephone protocols and VOIP. Prerequisites: CENG 268 or ENGR 220.

425. PARALLEL PROGRAMMING. (3) Fall of even years. Developing multi-tier and peer-to-peer software for large-scale and high-performance environments. Dynamic Link Libraries, component-based programming, sockets, remote procedure calls, client-server architectures, transaction monitors, object request brokers, multi-threading and current industry tools. Prerequisites: COMP 311 and 345.

430. ARTIFICIAL INTELLIGENCE. (3) Fall of even years. Concepts and techniques used in the development of intelligent systems. Knowledge representation, game playing, search techniques, heuristics, deduction, learning, natural language processing, rule-based expert systems, constraint exploitation, and an appropriate programming language such as LISP or PROLOG. Prerequisite: COMP 245.

431. INTERNET DEVELOPMENT II. (3) Spring. Advanced Internet programming, including Java development, applets, servlets, Java Server pages, XML processing, and ASP.NET technologies. Prerequisites: COMP 245 and 250.

445. GRAPHICAL USER INTERFACE PROGRAMMING. (3) Fall. Software development under event-driven, graphical user interface environments. Messaging, eventdriven programming, window creation and management, window procedures, graphical resources, dialog boxes, CUA interfaces, device independence, printing, object linking and embedding, multiple document interfaces, object-based class libraries, and developing and integrating online help. Prerequisite: COMP 245.

446. COMPUTER GRAPHICS. (3) Spring of odd years. Mathematical and programming techniques central to computer graphics, including scaling, transformations, translations, rotations, reflections, projections, windowing, rendering, generated surfaces and hidden surface removal. Prerequisites: COMP 245 and MATH 313.

ELECTRICAL ENGINEERING (EENG)

130. ELECTRICAL PROPERTIES OF MATERIALS AND MANUFACTURING PROCESSES. (3) Spring. Materials for electrical engineering, atomic bondings, crystalline structures, properties of metals, glasses, semiconductors, insulators and magnetic materials. Electronic conduction in solids and simple devices. The manufacturing of electrical and electronic devices. Prerequisite: CHEM 121.

240. DIGITAL LOGIC DESIGN. (4) Spring. Number systems and base conversions. Analysis and design of digital circuits. Logic and sequential design. Introduction to microprocessors. Three lecture/three laboratory hours per week. Prerequisite: EENG 220.

320. ELECTRONICS. (4) Fall. Solid state devices as elements of electronic circuits; linear models and linear operation of these devices emphasized. Three lecture/three laboratory hours per week. Prerequisite: ENGR 221 and PHYS 212.

330. DIGITAL ELECTRONICS. (3) The analysis and design of digital electronics using CMOS technology to meet given performance and economic objectives. Prerequisite: ENGR 320 or consent of instructor.

340. SIGNALS AND SYSTEMS. (3) Fall of even years. An introduction to the modeling and analysis of signals and systems. Topics include convolution, continuous time Fourier series, Fourier transform, Laplace transform, bandwidth, basic filter design, modulation techniques, random variables, random processes and spectral density. Prerequisite: ENGR 221.

345. COMMUNICATION THEORY. (3) An introductory course in communication theory for both digital and analog systems. Topics include Fourier analysis, moducation and demodulation theory, digital signaling formats, communication system design fundamentals and applications. Probability and random processes are introduced and applied to the study of narrow band noise in communication systems. Prerequisites: EENG 340, MATH 351.

350. DIGITAL SIGNAL PROCESSING. (3) Spring of odd years. Analysis of discrete-time signals and systems. Discretetime Fourier analysis, sampling of continuous-time signals, z-transform, and transform analysis of discrete time systems. Prerequisite: ENGR 221.

380. ELECTROMECHANICS. (3) The analysis and design of electromechanical devices. Emphasizing magnetic fields of currents and coils, magnetic materials, magnetic circuits, transformers, and fundamentals of electric motors and their control. Prerequisite: ENGR 221, PHYS 212.

420. MICROPROCESSORS (4) Spring. Hardware and software aspects of interfacing microprocessor CPUs to ROM, RAM, parallel ports and serial ports. Applications of serial and parallel ports. Displays, keyboards, A/D and D/A converters. Two lecture/ six laboratory hours per week. Prerequisite: COMP 268 or CENG 260 or EENG 321.

MECHANICAL ENGINEERING (MENG)

130. MATERIAL SCIENCE AND MANUFACTURING PROCESSES. (4) Spring. An introduction to material science and manufacturing methods. Discussions include the effects of manufacturing processes on the structure and properties of various materials, theory of metal cutting and forming, material selection, design for manufacture, and Computer Aided Machining. Laboratory involves appropriate exercises, case studies and tours of local manufacturing facilities. Prerequisite: CHEM 121.

225. STATICS. (3) Fall. Analysis of force systems in static equilibrium. Topics include force vectors, equilibrium of particles and rigid bodies, structural analysis, distributed forces, friction, center of gravity, moments of inertia. Prerequisite: MATH 201.

226. DYNAMICS. (3) Spring. Topics include kinematics of a particle; dynamics of a particle; kinematics of a rigid body in plane motion; dynamics of a rigid body in translation; dynamics of a rigid body in rotation; dynamics of a rigid body in plane motion; and impulse and momentum.

230. CIRCUITS FOR MECHINICAL ENGINEERING. (4) Fall. Kirchoff's Laws. Fundamental properties of DC and AC circuits. Circuit Analysis methods and circuit elements including operational amplifiers, diodes and transistors. Three lecture/three laboratory hours per week.

280. MECHANICS OF MATERIALS. (3) Stress and strain analysis applied to beams, pressure vessels, pipes and combined loading. Prerequisites: MENG 225 and MATH 301

320. THERMODYNAMICS. (3). Fall. An introduction to the science of energy. The fundamentals encountered in chemistry and physics are reinforced, and application of these fundamentals is made to practical engineering design. New material involving the laws of thermodynamics is introduced and a wide variety of applications are made. Topics include the energy analysis of closed systems and control volumes, power generation and refrigeration cycles, and compressible flow. Prerequisite: MENG 226.

321. HEAT AND MASS TRANSFER. (3) Theories and applications of heat and mass transport phenomena, emphasizing their analogies and contrasts. Fourier's law. Steady and unsteady diffusion. Mass transfer coefficients. Absorbers. Simultaneous heat and mass transfer. Prerequisite: MENG 320.

340. FLUID MECHANICS. (3) Fall. An introduction that emphasizes fundamental concepts and problem-solving techniques. Areas of emphasis include fluid properties, fluid statics, flid kinematics, control volume analysis, differential analysis, dimensional analysis, and basic internal and external flows. Other topics include pipe flow, lift and drag, Navier-Stokes equations, turbo-machinery, open-channel flow, compressible flow, and computational fluid dynamics. Prerequisite: MENG 226.

370. THERMODYNAMIC SYSTEMS. (3) Spring. A continuation of MENG 320. Topics covered include availability and reversibility, power and refrigeration cycles, mixtures and solutions, chemical reactions, Maxwell's equations, and flow through nozzles, diffuser and bladed passages. Prerequisite: MENG 226.

401. STRUCTURAL VIBRATIONS. (3) Fall. Dynamic modeling and analysis of single and multiple degree-of-freedom and continuous structural systems using Newtonian and Lagrangian techniques. Prerequisites: MENG 226 and MATH 351.

410. MECHANICAL ENGINEERING LABORATORY. (2) Spring. A laboratory course focusing on experimental design and evaluation of complete mechanical engineering systems. Emphasis is on evaluating system performance and improving student written and oral communication skills. One hour lecture/three laboratory hours per week. Prerequisites: ENGR 360, MENG 320, MENG 340, and corequisite MENG 321.

415. INTRODUCTION TO MICROELECTRO-MECHANICAL SYSTEMS. (3) Spring. Covering material properties, fabrications techniques, basic structure mechanics, sensing and actuation principles, circuit and system issues, packaging, calibration, and testing.

420. MACHINE DESIGN. (3) Spring. Introduction to the process of design. Various machine components are discussed. Issues in stress analysis, failure, safety and reliability are covered. The analyses include a variety of case studies used to teach problem solving techniques necessary for success in the design of machines and other engineering systems. Prerequisites: MENG 130 and 226.

425. TRIBOLOGICAL DESIGN. (3) Spring odd years. Analysis of tribological aspects of machine components, including friction , lubrication and wear. Prerequisites: MENG 280 and MENG 340.

430. MACHINE DYNAMICS. (3) Spring of even years. Kinematic and Newtonian dynamic analysis and synthesis of machine elements including linkages, cams and gears. Balancing of rotating and reciprocating systems. Prerequisites: CENG 170 and MENG 226.

445. DESIGN WITH FINITE ELEMENTS. (3) Review of basic laws of continuum, variational and weighted residual method, element type, interpolation function, boundary conditions, transformation and assembly of element matrices, solution methods and accuracy. Examples from solid mechanics. Heat transfer and fluid mechanics. Prerequisites: MATH 351, MENG 321, 340.