

Brief Course Description – Sorted by Course Code

Course Title & Code	Brief Course Description
Object-Oriented Programming (0101202)	This course is the second programming course in Java. Topics include inheritance; abstract function; I/O streams; exception handling; polymorphism; recursion; graphical user interface; and java applets.
Database Systems (0101302)	This course introduces the basic concepts of databases, which include database system architecture; logical organization of databases; entity-relationship model; hierarchical, network, and relational data models; functional dependencies and normal forms. Design, implementation, and optimization of query languages; security and integrity; concurrency control; distributed database systems.
Operating Systems (0101306)	This course covers history of operating system concepts. Process: inter-process communication, process scheduling, and deadlocks. Input/output: principles of I/O hardware and software, disks and clocks. Memory management: swapping, paging, virtual memory and page replacement algorithms, file systems. Some examples of operating systems will be introduced.
Internet Computing (0101407)	This course introduces the basic programming and scripting languages for the Internet use. It covers basic concepts of designing Web pages using variety of Web-based languages such as: HTML, XHTML, CSS, JavaScript and Others. Client side and server side programming issues will also be discussed.
Digital Logic Design (0102203)	This course presents the theory of digital circuits and systems, stressing techniques for the analysis and synthesis of combinational and sequential logic systems. It covers the operations of basic logic gates, example of some combinational and sequential circuits such as adders, subtractors, decoders, encoders, flip-flops, counters and shift registers.
Digital Logic Design Lab (0102213)	Digital logic; Number systems and binary codes; Boolean algebra and basic results; switching functions; minimization techniques; analysis and design of combinational and sequential logic circuits.
Foundations of Software Engineering (0101204)	This course introduces basic concepts of software engineering. The software engineering process: development and maintenance. The course covers the software engineering life cycle models and deliverables; requirements analysis and specification; architectural and detailed design; implementation; verification, and testing and development process issues.
Design and Analysis of Algorithm (0102305)	This course emphasizes the fundamental concepts of algorithm design and analysis such as searching, sorting and graph algorithms. Examples include divide-and-conquer dynamic
Formal Languages and Automata Theory (0102306)	This course emphasizes the fundamental concepts of formal language theory and finite automata. The course covers an overview of grammars and parsing techniques. Decidability and undesirability will also be covered.
Introduction to Artificial Intelligence (0102308)	This course covers the nature of intelligence; the symbol system hypothesis; representation and logic; basic problem solving techniques; machine learning; natural language understanding; computer vision; robotics; and societal impact of AI.

System Analysis and Design (0102309)	This course covers system concepts; system development life cycles and an overview of system development activities; communication in system analysis; tools for system analysis; project management and control; prototyping; enhancement, and quality.
Computer Networks (0102401)	This course introduces Network uses, Network components, Network classification and services. Further this course covers Network architectures, Network protocols and their performance. Study of specific protocols, methods, and algorithms for framing, flow control, error detection and correction, medium access, routing, congestion control, internetworking, addressing, connection establishment and release, multiplexing, and fragmentation. Overview of the Internet application protocols, resources, and services.
CS Internship (0102402)	The main objective of the internship is to provide our undergraduate engineering students with hands-on exposure to real world experience in one or more significant application domains. The internship must be off-campus and students must complete at least one semester of work consisting of 240 hours or 20 hour work per week.
Special Topics in Computer Science (0102403)	This course involves special topics in computer science which are chosen by the student in conjunction with the course lecturer.
CS Capstone Project (0102404)	This course involves a significant (Final Year) design project that satisfies the AAU senior project requirement and ABET engineering design requirement.
Introduction to Computer Graphics (0102405)	This course introduces basic concepts of computer graphics and interactive graphics. This includes graphics geometry, primitives, two- and three-dimensional representations. The course also covers transformations; Windowing and clipping and computer animation.
Simulation and Modeling (0102407)	This course covers modeling principles; data collection and analysis; simulation with general-purpose programming languages; simulation with special-purpose simulation languages.
Data and web Mining (0103408)	The course introduces the principles of (Web) data mining. Topics include Web- usage mining, Web-content mining, and their applications to e-commerce.
Programming Languages and Compilers (0102409)	This course introduces students to the fundamental concepts of compilers. The course focuses on grammars and parsing techniques for regular languages.
Multimedia Technology (0102411)	This course introduces the multimedia technology concepts to the students. It covers basic concepts of multimedia, applications, and building blocks, such as: Text, Image / Graph, Audio, Video and Animation. This course also covers the compression concepts of image, audio and video. Multimedia input, output devices; hardware and software used in multimedia; communication and computer theory; social and legal issues will also be discussed.
Computer Vision and Image Processing (0102413)	This is an introduction to computing vision, including basic techniques of analysis and manipulation of pictorial data by a computer. Applications such as optical character recognition may be introduced.

<p align="center">Data Structures & Algorithms (0103201)</p>	<p>This course Introduces the basics of algorithm design. It covers Data abstraction & Abstract Data Types (ADT). Linear structures: Multidimensional arrays and their storage organization. Lists, stacks, and queues. The course also covers Recursion, Nonlinear structures: trees, and graphs. Binary trees. Tree Traversal algorithms. Graphs: representation of a graph and applications of graphs. Elementary sorting and searching methods: bubble sort, quicksort, sequential search, and binary search algorithms.</p>
<p align="center">Computer Organization and Architecture (0103202)</p>	<p>This course covers the fundamentals of computer organization and machine architecture; data representation; the machine language execution cycle; microprogramming; addressing modes; symbolic assembly level of language; memory; I/O; fundamental notions of an operating system.</p>
<p align="center">Software Requirements and Specifications (0103303)</p>	<p>This course introduces requirements engineering within software life-cycle: requirements elicitation and modeling issues and techniques; documentation and management of requirements; standards and CASE tools; cognitive and socio organizational issues.</p>
<p align="center">Software Design & Development (0103304)</p>	<p>The Software Design and Development is designed to develop in students the knowledge, understanding, skills and values to solve problems through the creation of software solutions. The course introduces students to nature of software design, design process, design principles, design notations, design tools and design patterns. It covers both software product design and software engineering design. Engineering design will be discussed at architecture level, mid-level and low level separately.</p>
<p align="center">Formal Specification & Design Methods (0103305)</p>	<p>This course introduces the formal specification concepts to the students. It covers basic concepts of formal specification and its design methods. This course also covers the model based techniques (i.e. Z Specification), Z notations, formal specification set theory, formal specification paradigms, Z notations relations and functions, Z schema, Z-specifications process, formal reasoning and data & operation refinement will also be discussed.</p>
<p align="center">Software Evolution and Maintenance (0103401)</p>	<p>This course covers the concepts and advanced technologies in software evolution, including program comprehension; construction of reusable software, layered design and incremental refinement; and legacy systems.</p>
<p align="center">SE Internship (0103402)</p>	<p>The main objective of the internship is to provide our undergraduate engineering students with hands-on exposure to real world experience in one or more significant application domains and to manage the development of software systems. The internship must be off-campus and students must complete at least one semester of work consisting of 240 hours or 20 hour work per week.</p>
<p align="center">Database Design (0103403)</p>	<p>This course covers a review of the relational data model and an introduction to distributed databases, including DBMS architectures; client/server systems; data warehousing and web database development; security; and evaluation strategies.</p>
<p align="center">SE Capstone Project (0103404)</p>	<p>This course involves a significant (Final Year) design project that satisfies the AAU senior project requirement and ABET engineering design requirement.</p>
<p align="center">Software Measurement and Testing (0103405)</p>	<p>This course is an introduction to software testing and metrics within the context of software quality engineering; module and unit testing; integration and acceptance testing; quality factors and metrics; verification and validation; review and inspections; reliability, security and safety assurance; software certification; automated software testing.</p>

Software Project Management (0103406)	This course introduces project management concepts, tools, and techniques: organization of a large software project; roles of team members; leaders and managers skills and responsibilities; scope management; scheduling; budget control; progress monitoring; integration management; human resource management; communication management.
Object-Oriented Analysis and Design (0103407)	This course introduces the object-oriented analysis design, which includes the Unified Process development cycle; use case analysis; Unified Modeling Language (UML) sequence and static diagrams; encapsulation; inheritance; polymorphism; design principles of coupling and cohesion; design patterns. The course includes a large-scale software-development project.
Introduction to Distributed Systems (0103409)	This course introduces the theory of distributed systems and networks, including distributed system and network characteristics; failure, and through-put; types of network interaction; fault tolerance; recovery from failure etc.
User Interface Design (0103410)	This course introduces the User interface (UI) design concepts along with principles; standards; and guidelines. User-centered design concept includes standards and design rationale; heuristic evaluation; iterative design; and prototyping will be covered. Task-centered design, Rationalized design, usability engineering; dialogue notations; user models; diagrammatic notations; and textual notations will also be covered.
New Approaches to Software Engineering (0103411)	This course covers recent developments in various areas of software engineering, including component-oriented development; aspect-oriented development; pattern-oriented development; service-oriented software development; etc.
Security of Information System (0103412)	This course will introduce the security of information systems. Several types of threats and their attacks on the information systems and how to deal with them will be discussed. Elements of cryptography and its standards will be covered. Access control, firewall, host and data security, application security, incident and disaster recovery will also be the part of this course.
Circuit Analysis I (0104202)	This course serves as an introduction to linear circuit analysis. Topics include resistive circuits; Ohm's law; Kirchhoff's laws; Superposition theorem, Source Transformation, Thevenin's and Norton's theorems, Nodal and Loop analysis techniques.
Circuit Analysis Lab (0104222)	Laws and fundamentals concepts that govern the behavior of electric and magnetic circuits; Ohm's Laws, ideal models of resistors, voltage and current sources, capacitors and inductors; three-phase circuits and transformers.
Circuit Analysis II (0104301)	Sinusoidal steady state analysis, phasors, use of capacitor and inductors in AC Circuits, Transformers, RC, RL and RLC Circuits, Resonance, Passive Filters, Circuit Theorems in AC Analysis, Time Response of Reactive Circuits.
Digital Electronics (0104302)	This course includes discussion of digital design techniques for integrated circuits. Emphasis is on the design of logic gates at the transistor level. A number of different logic families are described, but CMOS is emphasized.
Signals and Systems Analysis (0104303)	This course covers the followings topics in signals and systems: continuous and discrete time representations of signals, system modeling and analysis using differential and difference equations as well as Fourier, Laplace and z transforms. State description of continuous and discrete time transfer functions will also be discussed.

<p>Microprocessors and Assembly Language (0104304)</p>	<p>This course includes microprocessor systems; the 8088/8086 microprocessor; addressing models; instruction sets and assembly programming of 8088/8086 hardware specifications; memory interface; input; output interface; and interrupts.</p>
<p>Electronic Circuits (0104305)</p>	<p>This course covers P-N junction circuits and applications; Zener diodes; bipolar and FET transistor biasing; small signal models for diodes and transistors; and single and multistage amplifiers of BJTs and FETs.</p>
<p>Electronics Lab (0104306)</p>	<p>It explains the basic concepts of semi-conductor diode and its current-voltage relationship. Various applications of junction diode are discussed. Various types of diodes are also explained. Bipolar junction transistor and field-effect transistor are evolved as two PN-junction devices. Relations of various currents and voltages in these transistors are explained in detail. The effect of temperature on these semiconductor devices is highlighted. Similarly the working principles of op-amps and MOSFET are also taught. Their critical parameters impacting design of amplifiers are talked about in details. A variety of applications of various types of transistors and MOSFET are dealt with.</p>
<p>Advanced Computer Architecture (0104401)</p>	<p>This course is an introduction to advanced computer architecture and computer systems design. Topics include the exploration of principle architecture features of modern computers; pipelining; memory hierarchy; I/O devices.</p>
<p>Design of Digital Systems (0104402)</p>	<p>This course covers algebraic and truth-table representation of logic functions and variables; optimizations of combinational logic, using “don’t cares”; multi-level logic optimization; transistor-level design of logic gates; propagation delay and timing of gates and circuits.</p>
<p>Cryptography and Computer Network Security (0104404)</p>	<p>This course introduces the basics of cryptography and its application to computer network security services and mechanisms, such as confidentiality, digital signature, access control, and electronic payments. Topics like, analysis of software and hardware implementations of cryptographic algorithms and network-security protocols will also be discussed.</p>
<p>Real-Time Embedded Systems (0104405)</p>	<p>This course provides an introduction to real-time embedded systems; embedded software development; reliability and fault tolerance; synchronization and communication; atomic actions; and resource control and scheduling.</p>
<p>VLSI Systems and Design (0104407)</p>	<p>This course serves as an introduction to the design, verification and layout of VLSI circuits for complex digital systems. Focus is on CMOS technology. Issues that are covered in the course include CAD tools and algorithms; clocking, etc.</p>
<p>CE Internship (0104502)</p>	<p>This course provides real world experience in Computer Engineering field. The internship must be off-campus and students must complete at least one semester of work consisting of 240 hours or 20 hour work per week.</p>
<p>CE Capstone Project (0104504)</p>	<p>This course involves a significant project in any area of Computer Engineering. The project may be undertaken individually or in small groups.</p>
<p>Robotics (0104506)</p>	<p>This course addresses the fundamentals of analytical robotics as well as the design and control of industrial robots and their instrumentation. Topics include forward, inverse, and differential kinematics; position and force sensors; and vision and image processing in robotic systems</p>

<p align="center">Electromagnetic Theory (0106202)</p>	<p>This course introduces basic concepts of Electromagnetic Theory. It includes discussion of static electric field dielectrics, polarization, field distributions of charges, steady electric currents, field at boundary conditions, and Maxwell's equations. Prior knowledge of vector calculus, differential equation and undergraduate level electromagnetic theory is required.</p>
<p align="center">Data and Computer Communications (0106302)</p>	<p>This course provides an overview of computer networking; communication and transmission systems; physical layer issues, an introduction to signal analysis (Nyquist and Shannon), impairments, modulation/demodulation, Internet protocols, LANs.</p>
<p align="center">Introduction to Communications Systems (0106305)</p>	<p>This course includes a review of signals; linear systems and Fourier theory; signal bandwidth and spectra; digital waveform coding; an introduction to analogue and digital modulation systems; synchronization; characterization and effects of noise; link budgets; communications media and circuits; and applications to current communications systems.</p>
<p align="center">Communication Lab (0106307)</p>	<p>This lab course is an introduction to the most common techniques that are used to build both analog and digital communication systems using a modern digital signal processing approach. Digital communication systems are introduced by looking first at base methods such as pulse amplitude modulation (PAM), pulse width modulation (PWM), pulse code modulation (PCM) and pulse position modulation (PPM). The combination of all these modulation finally leads to the most commonly used digital modulation systems such as frequency shift keying (FSK), phase shift keying (PSK) and amplitude shifting key (ASK).</p>
<p align="center">Random Signals and Systems (0106306)</p>	<p>This course includes discussion of probabilistic models, conditional probability and Bayes' rule; vectors of random variables; distributions and density functions; expectations and characteristic functions; independence; Laws of Large Numbers; Central-Limit Theorem; random process concepts; random signal analysis concepts.</p>
<p align="center">Computer Network Protocols and Applications (0106401)</p>	<p>The course introduces Communications services, protocols and software. It covers Internet Protocols and IP addressing. Transport protocols: TCP, UDP. The course also covers Quality of Service, connection management, flow and congestion control. Session, presentation and application protocols, such as DNS, Security, SNMP, HTTP. Performance issues.</p>
<p align="center">Network Lab (0106402)</p>	<p>The focus of this course is on learning the fundamentals of networking. Topics include: the two major models used to plan and implement networks—OSI and TCP/IP; the functions and services of the OSI and TCP/IP layers; the various network devices, network addressing schemes, and the types of media used to carry data across the network. Labs will include hands-on configuration of routers and switches in client-server and peer-to-peer environments with utilization of various network tools for protocol data unit analysis and troubleshooting.</p>
<p align="center">Computer Network Management (0106404)</p>	<p>The focus of this course is to have an introduction to methods, techniques and tools for the management of telecommunication systems and networks: SNMP network management; OSI network management; CMIP; Web-based Network Management; Remote Monitoring (RMON, RMON2), Configuration and name management, fault and performance management, security, and accounting management.</p>
<p align="center">Digital Communications (0106407)</p>	<p>This course starts with review of probability, random variables, and signal representation. The course also covers Baseband data transmission: Nyquist criterion, equalization, optimal receiver, error probability. Digital modulation, performance. Synchronization. Introduction to information theory. Error detection and correction. Spread spectrum. Applications to current digital wired and wireless communications systems.</p>
<p align="center">Wireless Communications Fundamentals (0106408)</p>	<p>This course introduces cellular technologies, spread spectrum, antennas and propagation, error control and coding. Further topics for example satellite communications, Wireless LANs and Bluetooth LANs along with Mobile IP and wireless access protocol will also be covered.</p>

Digital Signal Processing (0106411)	This course includes discussion of analogue-to-digital and digital-to-analogue converters; Fourier analysis algorithms; discrete-time systems; the theory and design of digital filters; and the Fast Fourier Transform (FFT).
Antennas (0106413)	This course covers linear dipole antennas; antenna arrays; thin-wire antennas; broadband and frequency-independent antennas; computer- aided design and analysis of wire antennas; feed networks and antenna arrays using antenna CAD software.
Optical Communications (0106415)	This course covers optical fibers; structures and wave-guiding fundamentals; signal degradation in fibers arising from attenuation, PIN and avalanche photo-detectors; and optical receiver design.
NCE Internship (0106502)	This course provides real world experience in Networks and Communication Engineering field. The internship must be off-campus and students must complete at least one semester of work consisting of 240 hours or 20 hour work per week.
Satellite Communications (0106503)	Basic concepts of satellite communications. Orbital aspects. Satellite subsystems, launching methods, and on-board processing. Design of a digital satellite link, link budgets, modulation, error control, baseband signaling, and multiple access methods. Frequency assignments and propagation aspects. Antennas and earth station technology. Non-geosynchronous orbits and their applications. Specific applications of satellites, including the global positioning system (GPS), satellites for mobile communication, and satellites for internet.
NCE Capstone Project (0106505)	This course involves a significant (Final Year) design project that satisfies the AAU senior project requirement and ABET engineering design requirement.
Calculus I (0107101)	This course covers the concept and methods of Differentiation, curve sketching, maximum-minimum problems, related rates, mean-value theorem, and it will also cover the concept of anti-derivative, Riemann integral, logarithm, and exponential functions.
Linear Algebra (0107102)	This course introduces the Linear equations, Gaussian elimination, Matrices, Vector spaces, Linear transformations, Determinants, Eigen values, and Eigenvectors
Probability Theory and Statistics (0107103)	This course covers a progression of topics from introduction to statistics, constructing and interpreting graphs, measures of central tendency, measures of dispersion (or variation), measures of position, the fundamental principle of counting, permutations and combinations, probability, discrete probability distributions and the normal distribution. Applications and problem solving are emphasized.
Calculus II (0107104)	This course covers the techniques of integration, arc length, solids of revolution, applications, polar coordinates, parametric equations, infinite sequences and series, power series.
Introduction to Numerical Methods (0107201)	This course provides an overview of and practical experience in utilizing algorithms for solving numerical problems arising in applied sciences. Topics covered will include solution of linear and nonlinear equations, interpolation, numerical differentiation and integration, solution of differential equations and system of linear algebraic equations. Matlab sessions will be utilized in this course.

Engineering Math (0107202)	This course introduces Ordinary differential equations, Laplace transform, complex variables and functions, Vector algebra and vector differential calculus, Fourier series and Fourier transform.
Principles of Biology (0200101)	This Course gives basic information about biology starting from type of cells to tissues, organs and systems. It describes the reproduction in living organisms and how heredity acts in developing new characteristics. This subject takes some human systems in details how they work, what are the factors that affect their work, how can we help our body stay healthy and perform in the best way.
Chemistry (0200102)	This course covers the study of fundamental concepts and laws underlying chemistry, including states of matter; atomic structure; the periodic table; chemical bonding; chemical reactions; solutions; gas laws; properties of solids and liquids; and qualitative and quantitative analysis.
Physics I (0108103)	This course covers vectors; motion in one dimension; motion in two dimensions, Newton's laws of motion; circular motion; work and energy; potential energy; momentum; and collisions.
Physics I Lab (0108111)	An introduction to the fundamental concepts of classical mechanics: Newton's laws, conservation of momentum and energy, and oscillatory and rotational motion.
Physics II (0108201)	This course gives view of Electric charge and electric field, Coulomb's law, Gauss's law and its applications, Capacitance and dielectric, Current and resistance, Direct current circuits, Magnetic fields, Source of magnetic field and Faraday law.
Physics II Lab (0108211)	This course gives experimentally view of Electric charge and electric field, Coulomb's law, Gauss's law and its applications, Capacitance and dielectric, Current and resistance, Direct current circuits, Magnetic fields, Source of magnetic field and Faraday law.
Introduction to Programming (0109202)	This course introduces programming in java: variables; simple types; operators and expressions; conditional and repetitive statements; input and output; study of fundamental concepts of object-oriented programming such as classes objects, and methods using an object-oriented language such as java.
Discrete Structures (0109206)	This course introduces Number systems, which includes Natural numbers, mathematical induction. Logic: propositional logic; predicate logic; Boolean algebra; sets; recursion; relations; and functions. Combinatory: Counting principles; permutation groups. Graphs: Graphs; diagraphs; trees. Probability theory.
Computer Ethics (0109400)	This course addresses a definition of ethics, provides a framework for making ethical decisions, and analyzes in detail several areas of ethical issues that computer professionals are likely to encounter in business. Topics include philosophical, business, and professional ethics, privacy, criminal conduct, property rights, free speech, access, and reliability.
Principles of Management Information Systems (0506203)	This course covers the fundamentals of Information Systems Management; IS Strategy techniques, trends, and implementation; IS security and protection; end-user interaction and services, developments, and the future of this field of study.