SOFTWARE ENGINEERING (SENG), BACHELOR OF SCIENCE

At Dunwoody College of Technology, the Software Engineering bachelor’s degree prepares students to enter the field of Information Technology as software engineers. Graduates can find employment in a variety of IT fields working for almost all industries, including medical, financial, manufacturing, consumer, military, and energy.

Students learn how to apply engineering principles in the successful development, testing, management, implementation, and evolution of software products. Coursework builds knowledge in software product development and life cycles; web applications and services; distributed and cloud computing; database applications; and cross-device application development. Students learn to work collaboratively in a team environment and use quality tools and data to anticipate and solve issues in the engineering process. Curriculum is project-based so that theoretical engineering principles are reinforced and experienced through hands-on creation and problem-solving. Arts & Sciences courses help students understand the core mathematical and scientific principles that all engineering projects grow out of as well as providing students with the communication and critical thinking skills required to succeed in the profession.

The degree culminates in a senior project, which provides students the opportunity to round out their professional portfolio.

Credential Earned: BS  
Length of Program: 4 years (8 semesters)  
Classes Offered: Day  
Available Starts: Fall Semester

Program Outcomes

• An ability to apply knowledge of math, science, and software engineering as well as collect, analyze and interpret data.
• The ability to analyze, design and manage the development of a computing-based system, component or process to meet desired needs within realistic constraints in one or more application domains.
• An ability to function on multidisciplinary teams.
• An ability to identify, formulate, and solve software engineering problems using a well-defined engineering process.
• Demonstrate understanding of professional and ethical responsibility.
• Display a commitment to on-going professional competence and possession of basic professional and organizational success skills.
• Engage in lifelong learning.
• The ability to communicate effectively with colleagues, customers and executives.
• Demonstrate an understanding of the role and impact software engineering plays in business, global, economic, environmental and societal contexts.
• Apply appropriate tools such as discrete mathematics, probability and statistics, and other relevant tools in computer science and supporting disciplines to complex software systems.
• Display the ability to think critically, clearly identifying and using evidence, criteria, and values in decision making process.

Degree Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUMN4000</td>
<td>Ethical Decision-Making</td>
<td>2</td>
</tr>
<tr>
<td>MATH1250</td>
<td>Boolean Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH1811</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH1821</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH2250</td>
<td>Statistics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS1800</td>
<td>Physics I with Lab</td>
<td>4</td>
</tr>
<tr>
<td>WRIT2010</td>
<td>Technical Writing</td>
<td>3</td>
</tr>
</tbody>
</table>

Communications 3  
Humanities 3  
Mathematics/Natural Sciences 10  
Social Sciences 4

Technical Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWEB1110</td>
<td>Programming Fundamentals</td>
<td>4</td>
</tr>
<tr>
<td>MENG1120</td>
<td>Introduction to Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CWEB2010</td>
<td>Advanced Programming</td>
<td>4</td>
</tr>
<tr>
<td>CNTS1121</td>
<td>Network Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>SENG2200</td>
<td>Introduction to Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>SENG2100</td>
<td>Introduction to Computing</td>
<td>3</td>
</tr>
<tr>
<td>BCSA3110</td>
<td>Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>SENG2210</td>
<td>Software Design</td>
<td>4</td>
</tr>
<tr>
<td>SENG3110</td>
<td>Software Testing</td>
<td>3</td>
</tr>
<tr>
<td>SENG3120</td>
<td>Software Process Improvement</td>
<td>3</td>
</tr>
<tr>
<td>SENG3300</td>
<td>Data Introduction</td>
<td>3</td>
</tr>
<tr>
<td>SENG3210</td>
<td>Software Architecture</td>
<td>3</td>
</tr>
<tr>
<td>SENG3220</td>
<td>Software Project Management</td>
<td>3</td>
</tr>
<tr>
<td>SENG3230</td>
<td>Human-Computer Interaction</td>
<td>3</td>
</tr>
<tr>
<td>SENG4110</td>
<td>Software Engineering Senior Project I</td>
<td>3</td>
</tr>
<tr>
<td>SENG4310</td>
<td>Security I</td>
<td>3</td>
</tr>
<tr>
<td>MENG4230</td>
<td>Engineering Economics</td>
<td>2</td>
</tr>
<tr>
<td>SENG3310</td>
<td>Database Systems</td>
<td>4</td>
</tr>
<tr>
<td>SENG4210</td>
<td>Software Engineering Senior Project II</td>
<td>3</td>
</tr>
<tr>
<td>SENG4320</td>
<td>Security II</td>
<td>3</td>
</tr>
</tbody>
</table>

Technical Elective  
Choose any upper division technical courses 15

Total Credits 121

Courses Descriptions

CWEB1110 | Programming Fundamentals | Lec/Studio (4 Credits)
Basic programming principles like data types, variables, expressions, operators, Boolean logic, algorithm creation, flowcharts. Structured programming and programming logic constructs (sequence, selection, and loops). Abstraction, modularization, dynamic and static data structures, object-oriented and event driven programming.

MENG1120 | Introduction to Engineering | Lecture (3 Credits)
Explore major topics in Engineering. Provides students with a pathway to success in the program, including time management, industry software, study skills, internship availability and career opportunities.
CWEB2010 | Advanced Programming | Lec/Studio (4 Credits)
Create windows based applications. High level, event driven programming language concepts with an emphasis on user interface. Advanced object-oriented languages.
Prerequisite(s): CWEB1112

CNTS1121 | Network Fundamentals | Lec/Lab (3 Credits)
Concept and terminology introductions, data communications in a business environment. Client-server networking; communication hardware, software, and basic security is introduced. Services and models supporting data communications interoperability introduced. Configure and troubleshoot basic network connections and the hardware/software associated.

SENG2200 | Introduction to Software Engineering | Lec/Lab (3 Credits)
Introduction to software engineering as an area of computer science. Focused study of requirements; overview of various modeling techniques applicable to requirements and specifications, including UML and formal modeling.

SENG2100 | Introduction to Computing | Lec/Lab (3 Credits)
Introduction to computer science, software engineering, and the intersection of these fields with each other, other engineering disciplines, and the sciences in general. Historical perspectives on the fields. Ethics, team building, professional communication, and problem solving.

BCSA3110 | Discrete Mathematics | Lecture (3 Credits)
Examine the logic-related mathematical background necessary for upcoming courses. Topics include: logic, sets, functions (as defined in the Mathematics domain), sequences, algorithmic complexity, number theory, matrices, proof of complexity, mathematical induction, recursion, counting, probability, and graph and tree fundamentals.

SENG2210 | Software Design | Lec/Lab (4 Credits)
Designing software with long-term software quality. Software quality attributes, domain-driven design, software design patterns, and documentation.

SENG3110 | Software Testing | Lec/Lab (3 Credits)
Investigate testing methodologies. Tools and techniques in automated testing. Creation of documentation at all stages of testing.

SENG3120 | Software Process Improvement | Lec/Lab (3 Credits)
Assessment and improvement of the software development process. Techniques and tools related to each software development life cycle model and stage. Issues include those related to development and maintenance, quality, safety, security assurance, and project management. Quality assurance processes and techniques, ISO9000 and Software Engineering Institute Capability Maturity Model integration.

SENG3300 | Data Introduction | Lec/Lab (3 Credits)
Accelerated beginning course in data usage and management including language syntax, document model, document types, schemas and stylesheets from EXtensible Markup Language (XML) with a focus on creating structured content and data for business application. Integration of relational database concepts and design of database management systems for enterprise information needs. Data modeling with Unified Modeling Language (UML) and Structured Query Language (SQL) used for data definition to construct physical databases, for data manipulation and for data computation.

SENG3210 | Software Architecture | Lec/Lab (3 Credits)
Architecture of large-scale software systems. Architectural patterns, software quality, documentation of scenarios. Presentation to management for project funding and go/no-go decision making. Reusable component design and development. Explanation to design and development personnel.

SENG3220 | Software Project Management | Lec/Lab (3 Credits)
Planning, organization, estimation, risk management. Traditional and emerging software development life cycle models. Tools and techniques for management software projects.

SENG3230 | Human-Computer Interaction | Lec/Lab (3 Credits)
Design and evaluate interactive application interfaces, user- and task-centered approaches to design, guidelines for graphical design, interface evaluation techniques, current interface trends, including web interfaces and information visualization. Group projects that include designing, prototyping, and implementing an application interface.

SENG4110 | Software Engineering Senior Project I | Lec/Lab (3 Credits)
End-to-end project exhibiting all skills related to the profession. Focus is on requirements elicitation, scheduling, planning, reviews and postmortem, configuration management, and implementation of the project.

SENG4310 | Security I | Practicum (3 Credits)
Integration of data and users with an emphasis on security will be used in client/server, Internet, intranet/extranet, and other technologies. Review state-of-the-art technologies in each of the basic software and hardware arenas, while emphasizing management models and higher-level analysis using the computer.

MENG4230 | Engineering Economics | Lecture (2 Credits)
Combines the concepts of finance and economics with the engineering environment. Analyze costs, risk, funding options, economic return on investment, legal and environmental concerns.

SENG3310 | Database Systems | Lec/Lab (4 Credits)
Accelerated course in data management. Database server technology for enterprise-class data services and complex business logic. Server architecture, data integrity, data types, indexing, constraints, stored procedures, database schemas, normalization, data warehouses, data mining, data cubes. Structured Query Language, database normalization, database management systems (DBMS), implementation-independent database design, and security.
Prerequisite(s): SENG3300

SENG4210 | Software Engineering Senior Project II | Lec/Lab (3 Credits)
End-to-end project exhibiting all skills related to the profession. Focus is on requirements elicitation, scheduling, planning, reviews and postmortem, configuration management, and implementation of the project.
Prerequisite(s): SENG4110

SENG4320 | Security II | Lec/Lab (3 Credits)
Explore fundamental and emerging concepts of computer security.
Topics include: maintaining information confidentiality, protecting information integrity, assuring information availability, physical, technical, application, and Internet security, social engineering and associated attacks.

MATH1250 | Boolean Algebra | Lecture (3 Credits)
Binary, octal and hexadecimal number systems. Boolean algebra and mapping.

General Education: Mathematics

WRIT2010 | Technical Writing | Lecture (3 Credits)
Technical writing applications are studied for format, style, voice, and point of view; considered for purpose, audience, and subject. Critical thinking and developed expertise are employed to analyze, interpret, evaluate, summarize and generate various technical documents, individually and within teams.

General Education: Communications
MATH1811 | Calculus I | Lecture (4 Credits)
The fundamental tool used by engineers and scientists to determine critical measurements, such as maximums, minimums and allowable rates of change. Utilize multiple methods in the calculation and application of limits, derivatives, transcendental functions, implicit differentiation and related rates.

General Education: Mathematics

PHYS1800 | Physics I with Lab | Lec/Lab (4 Credits)
Introduction to mechanics using differential calculus as a foundation. Topics include kinematics and dynamics of linear motion, static equilibrium, the conservation of energy and momentum, mechanics of solids and fluids, and thermodynamics. The laboratory portion incorporates experimentation, instrumentation, and graphical tools to verify calculations in motion, mechanics and thermodynamics.

Prerequisite(s): MATH1810 Or MATH1811

General Education: Physical Sciences with Lab

MATH1821 | Calculus II | Lecture (4 Credits)
The fundamental tool used by engineers and scientists to determine critical measurements such as the area under curves, the volumes within complex geometries, and for describing functions as an infinite series. Computer software enables the application of the definite integral, the fundamental theorem of calculus, applications of integration, and numerical methods of integration.

Prerequisite(s): MATH1811

General Education: Mathematics

MATH2250 | Statistics | Lecture (3 Credits)
Descriptive and inferential statistics, frequency distributions, probability theory, and issues related to gathering data; computer spreadsheets facilitate the organization, analysis and display of data.

General Education: Mathematics

HUMN4000 | Ethical Decision-Making | Lecture (2 Credits)
Examine major moral theories of right and wrong, such as utilitarianism, deontology, egoism, virtue ethics, and feminism. Apply these theories in sound, ethical decision-making particularly in one's professional life. Through case studies, the consequences of a decision in terms of responsibilities to the company and the economy, to the people impacted by the decision, and to the environment at large are weighed. Explore the tension often created by the difference between what is morally right and what the company's code of ethics states or what the society's laws require.

General Education: Upper Humanities