Electronic Systems Technologies

The Bachelor of Science in Electronic Systems Technologies (EST) provides advanced technical and managerial coursework for students pursuing careers in the electronics industry. The program allows students the flexibility to choose a curriculum that will complement their career goals with their educational and work experience. Graduates with an EST degree possess the skills required of the technologist entering areas such as biomedical equipment technology, communications and networking technology, and automation and control technology. The Electronics Management Specialization (ELM) within the EST degree is well suited for technicians or technologists with coursework and work experience seeking advancement or placement in managerial roles in the electronics industry.

The Electronic Systems Technologies degree is a baccalaureate completion degree (300/400-level coursework for a 2+2 degree) designed as a path for students who have completed Electronic Technology AAS degree or equivalent. Students with other types of education and training can also be admitted, including those with military training. Students entering the completion degree are expected to have had coursework, documented training or work experience in the following technical subject areas:

- DC/AC Electronics Fundamentals
- Solid State Electronics Fundamentals
- Digital Electronics Fundamentals
- PC Troubleshooting & Repair
- LAN Networking
- A Programming Language
- Information Security Fundamentals

Students lacking formal education or documented experience in the listed areas may meet these requirements through a variety of methods. The Electronics Fundamentals requirements, with content equivalent to EST 101, EST 102 and EST 201, may be met through additional community college coursework, proficiency exams, or documented training. The PC Troubleshooting, LAN networking and programming language requirements may be met through SIU courses ISAT 121, ISAT 216, ISAT 224 and IST 209 respectively, available proficiency exams, or community college coursework. Please see our website for additional entry information and guidance (http://isat.siu.edu/undergraduate/electronic-technology/).

In addition, transfer credit for University Core Curriculum requirements varies depending on previous coursework. An individual who has earned an AAS degree also may qualify for the Southern Illinois University Carbondale Capstone Option. Capstone gives maximum credit for previous academic and work experience in the student’s occupational field and reduces the University Core Curriculum requirements.

The Electronic Systems Technologies program has a number of “Program Articulation Agreements” with electronics-related community college degree programs in order to facilitate the transfer of community college students to SIU. These agreements take full advantage of the Capstone Option for admission to the Bachelor of Science in Electronic Systems Technologies. Please check with your guidance counselor at the community college on the status of these articulation agreements.

If you have questions about how the degree requirements and articulation agreements apply to your personal situation, contact the community college program representative or the academic advisor in Electronic Systems Technologies at 618/ 453-7200 or through our website at http://isat.siu.edu/undergraduate/electronic-technology/.
Bachelor of Science Degree in Electronic Systems Technologies, College of Applied Sciences and Arts

An Electronic Systems Technologies (EST) major who chooses the Electronics Management (ELM) Specialization is provided a curriculum focused on the skills and knowledge necessary to effectively integrate current and emerging technology into the work place. The electronic devices are being transformed to smart objects with embedded sensors, onboard data processing capability, and a means of communication especially equipped with the Internet. This rapidly evolving field called the Internet of Things (IoT) needs understanding of Cyber Security and Network & System Administration of modern electronic systems.

Graduates will possess the technical, managerial and supervisory skills needed for entry-level positions in the electronics field with the increased potential in Cyber Security and Management for vertical mobility in today’s workforce.

The process of evaluating and acquiring new and existing technologies, planning and implementing security measures, maintaining and managing technological systems and effectively utilizing human resources will be studied. The graduate from this specialization will be able to communicate effectively and coordinate the efforts of skilled technicians in managing complex cyber-physical systems from increasing cyber attacks. Skills acquired will allow the graduate to train people in the use and maintenance of complex cyber-physical systems, plan and prioritize efforts to maximize the use of technological resources, and explain technical ideas to nontechnical personnel. Their responsibilities are continually expanding as the number of cyber attacks increases and more smart objects are connected.

Electronic Systems Technologies Major with an Electronic Management Specialization

<table>
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<tr>
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<th>Credit Hours</th>
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<td>University Core Curriculum Requirements ¹</td>
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<td>Approved Technical or Career Electives ²</td>
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<td>DC/AC Electronics</td>
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<td>Digital Electronics</td>
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<td>IST 209</td>
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<td>15</td>
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<tr>
<td>Requirements for Major in Electronic Systems Technologies</td>
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Electronic Systems Technologies with a specialization in Electronics Management

<table>
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<th>EST Core Requirements</th>
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<td>EST 340, EST 341, EST 451</td>
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<td>Degree Requirements</td>
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<td>ELM Specialization Requirements: EST 365, EST 385, EST 387, EST 388, IST 404</td>
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<td>Cyber Security</td>
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<td>EST 342, EST 404, ISAT 316, ISAT 335, ISAT 415, ISAT 460</td>
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<td>Network and System Administration</td>
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<td>EST 404, ISAT 327, ISAT 335, ISAT 411, ISAT 415, ISAT 418</td>
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<tr>
<td>Internet of Things (IoT)</td>
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<td>EST 308, EST 342, EST 343, EST 404, EST 407, ISAT 327</td>
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<tr>
<td>Internship or independent studies or approved equivalent (maximum 6)</td>
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<td>Total</td>
<td>120</td>
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1 The Capstone Option reduces University Core Curriculum requirements.
2 DC/AC, Solid State & Digital Electronics Electives may be satisfied through documented coursework, documented training, available proficiency exams or approved seminars. ISAT 216, ISAT 224 and IST 209 prerequisites for EST Electives may be satisfied through documented coursework, documented training or available proficiency exams.

**Electronic Systems Technologies Courses**

**EST100 - Intro to Electronics** 100-3 Introduction to Electronics. This course is an introduction to the field of electronics technology designed for students who are not majoring in Electronic systems technologies. It examines the role of the electronics technician and teaches the fundamental concepts of electronics.

**EST101 - DC-AC Circuit Analysis** 101-3 DC-AC Circuit Analysis. This course covers the theory and application of passive DC and AC circuits presented in a comprehensive manner using qualitative and quantitative methods. Theoretical topics such as Ohm’s Law and Kirchhoff’s Law are applied to analyze DC and AC circuits. Co-requisite: EST 111 and MATH 101 or MATH 108 or higher. Prerequisite: MATH 101 or MATH 108 or higher.

**EST102 - Electronic Circuits Theory** 102-3 Electronic Circuits Theory. This course presents the use and analysis of active and passive devices in electronic circuits. Semiconductor diodes, bipolar junction transistors and field effect transistors are discussed in circuit applications which include power supplies, amplifiers and switching circuits. Prerequisite: EST 101. Co-requisite: EST 112.

**EST111 - DC-AC Circuit Lab** 111-3 DC-AC Circuit Analysis Laboratory. This course introduces fundamental skills required by the electronics technicians. The fundamental laws of passive DC-AC circuits will be verified with experiments. Test equipment including the oscilloscope, multimeter, power
supply, and signal generator will be used to analyze and troubleshoot electronic circuits. Six contact hours. Concurrent enrollment in EST 101 or consent of school. Lab fee: $85 for DC-AC parts kit.

**EST112 - Electronics Circuits Lab** 112-3 Electronics Circuits Laboratory. This course introduces the fundamental operation, application and troubleshooting techniques associated with semiconductor devices. Formulas and theories associated with the operation of semiconductor circuits will be verified using the oscilloscope, multimeter, power supply and signal generator. Experiments demonstrate the application of diode, transistor amplifier and transistor switching circuits. Six contact hours. Prerequisite: EST 111. Co-requisite: EST 102.

**EST201 - Digital Circuits Theory** 201-3 Digital Circuits Theory. This course presents the concepts of digital circuits that make up systems such as numeric control, computers and communications networks. The application and analysis of counters, registers, arithmetic logic circuits, analog conversion circuits, memory circuits and basic microprocessor systems are presented. Prerequisite: EST 102.

**EST211 - Digital Circuits Lab** 211-3 Digital Circuits Laboratory. This course provides practical experience assembling, testing, and troubleshooting counters, registers, arithmetic logic circuits, analog conversion circuits, memory circuits and basic microprocessor systems. An emphasis is placed on the use of data books, safety and troubleshooting. Six contact hours. Prerequisite: EST 112 or consent of school. Lab Fee: $25 for digital electronics parts kit.

**EST223 - Certification Test Prep** 223-1 to 3 Electronics Certification Test Preparation. This course will provide the student an opportunity to prepare for industry recognized certification tests. This is an individualized self-paced course. Certification tests are in the areas of communications technology, biomedical technology, industrial electronics technology and computer technology. The student will be responsible for all fees associated with taking the certification tests and purchasing reference materials that are not provided by the program.

**EST258 - Electronics Work Experience** 258-1 to 30 Electronics Work Experience. Credit granted for prior job skills, management-worker relations and supervisory experience while employed in the electronics industry. Credit will be established by departmental evaluation. This credit may be applied only at the 100 and 200 level unless otherwise determined by the department chair. Restricted to electronic systems technologies majors.

**EST259 - Electronics Occupational Educ** 259-1 to 60 Electronics Occupational Education. A designation for credit granted for past occupational educational experiences related to electronic systems technologies. Credit will be established by departmental evaluation. This credit may be applied only at the 100 and 200 level unless otherwise determined by the department chair. Restricted to electronic systems technologies majors.

**EST300 - Electronic Mgmt Research** 300-3 Introduction to Electronic Systems Technologies Research. An introduction to library resources, electronic media resources and formal academic writing styles common to electronic systems technologies research. Introduction to basic theories, concepts and practices pertinent to electronic systems technologies. May be independent study. Restricted to electronic systems technologies majors.

**EST301 - Intro Biomedical Instr** 301-3 Introduction to Biomedical Instrumentation. This course covers a broad range of Biomedical Technician material including the maintenance, calibration, safe operation and management of biomedical equipment. Also covered are theory of operation, terminology, and underlying principles of biomedical equipment. Co-requisite: EST 311. Restricted to EST majors or consent of instructor.

**EST302 - Optical Electronics** 302-3 Optical Electronics. This course is designed to provide the theory and practice necessary to introduce the student to the broad fields of fiber optics and optoelectronics. Fiber optics is the optical technology concerned with the transmission of radiant power through transparent fibers, and optoelectronics pertains to devices that emit, modify or respond to optical radiation. Applications of fiber optics and optoelectronics to communications, imaging and sensing will be emphasized, with a concentration on communications applications. Lecture and laboratory. Restricted to Electronic Systems Technologies major or consent of school.
EST305 - Troubleshoot and Maintenance 305-3 Electronic Troubleshooting and Maintenance. This course covers troubleshooting and maintenance of electronic and interrelated systems. Formalized troubleshooting and preventative maintenance procedures will be covered with hands on theoretical exercises. Other areas include customer relations, documentation and proper test equipment usage. Lecture and Laboratory. Restricted to Electronic Systems Technologies major or consent of school.

EST306 - Technical Drawing 306-3 Technical Drawing. The theory and practice of computer-aided drawing and design encountered in the electrical/electronics industry. The course develops the competencies and skills necessary to produce the type of graphic documentation utilized in the field. Synthesis and design applications are also covered.

EST307 - Automation and Control Tech 307-3 Automation and Control Technology. The selection, programming, installation, maintenance, and troubleshooting of Programmable Logic Controllers (PLCs) and Programmable Automation Controllers (PACs) related industrial control devices. Individual components will be defined and examined with respect to the overall control system. Safety and standard practices will be emphasized throughout the course. Lecture and Laboratory.

EST308 - Device Interfacing & Control 308-3 Device Interfacing and Control. (Same as ISAT 308) This course provides a basis for electronic device interfacing for systems control. The principles of voltage, current, power, diodes, transistors, and other essential electronic devices will be covered as well as digital system principles. A major focus of the course will be interfacing to a micro-controller a variety of sensors and control devices necessary for system monitor and control. A grade of C or better required. Lecture and Lab. Prerequisite: IST 209 with a grade of C or better.

EST310 - IT Integration & Support 310-3 Information Technology Integration & Support. This course uses a lab/lecture approach designed to give students background information and "hands-on" experience with personal computers, network systems, and related technologies. An introductory presentation includes information on proprietary and open operating systems, basic networking and PC hardware components, peripheral devices, digital video and audio technologies, and local area network concepts and configurations. Students will disassemble and reassemble PCs, add and remove hardware devices, configure settings and drivers, and become familiar with basic troubleshooting practices. Emerging related and advanced technologies will also be explored.

EST311 - Biomedical Instrumentation Lab 311-3 Biomedical Instrumentation Laboratory. This course provides hands-on experience with the types of equipment encountered by a typical biomedical electronic technician (BMET). The exercises will teach the theory of operation, equipment safety, calibration and maintenance of biomedical equipment. Co-requisite: EST 301. Restricted to EST majors or consent of instructor.

EST317 - Industrial HMI 317-3 Industrial Human Machine Interfacing. The selection, programming, installation, maintenance, and troubleshooting of industrial Human Machine Interface (HMI) equipment. Programming of Programmable Logic Controllers (PLC) for HMI will be included. Individual components will be defined and examined with respect to the overall control system. Safety and standard practices will be emphasized throughout the course. Lecture and laboratory. Prerequisite: EST 307.

EST319 - Internship 319-1 to 15 Electronic Occupations Internship. Students will be assigned to a University approved program to engage in activities related to the Electronic Systems Technologies program and the student's career objectives. The student will perform duties as assigned by the work supervisor and the internship coordinator. Mandatory Pass/Fail. Special approval needed from the instructor.

EST320 - Elect Occupation Coop Educ 320-1 to 12 Electronics Occupations Cooperative Education. Each student will participate in a departmentally approved cooperative education program that includes formal instruction, training and/or career-related work experience. Students receive a salary or wages and engage in prearranged assignments related to their academic program and career objectives. Department faculty evaluation, cooperative agency student performance evaluations and student reports are required. Hours and credit to be individually arranged. Mandatory Pass/Fail. Special approval needed from the instructor.

EST338 - Alt & Renewable Energy Tech 338-3 Alternative and Renewable Energy Technology. This course examines alternative and renewable energy technologies and applications. Power generation
from solar, wind, geothermal, biomass, and fuel cell technologies will be discussed and reinforced with laboratory demonstrations. Power electronics will be reviewed with an emphasis on energy conservation and energy harvesting technologies. Lecture and laboratory.

**EST340 - App Solid State Devices** 340-3 Application of Solid State Devices. Lecture/lab. This course covers the characteristics of semiconductor materials, diodes, power supplies, thyristors, BJTs, FETs, and Op Amps. These devices will be applied to various amplifiers (including multistage), active filters, oscillators, and linear regulators and the student will perform in-depth circuit analysis on these circuits. Restricted to EST majors.

**EST341 - Digital Applications** 341-3 Digital Applications. Lecture/lab. This course covers digital combinational logic and simplification in order to create state machines that may be implemented in programmable logic devices or microprocessors/DSPs. The second part of this course (data synthesis) examines data acquisition, transmission, microcontroller/microcomputer architecture, and digital logic families. Restricted to ISAT majors.

**EST342 - Device Programming for IoT** 342-3 Device Programming for IoT. (Same as ISAT 342) This course provides a hands-on introduction to programmable devices that may be used with the Internet of Things (IoT). The course covers essential electronics, device interfacing and programming for local monitoring and control. The use of Wi-Fi or Ethernet for monitoring and control via the Internet will be explored as well as security methods for IoT devices. Students will be required to purchase a microcontroller system ranging in cost between $80-100. Lecture and Laboratory. A grade of C or better is required. Prerequisite: IST 209 with a grade of C or better. Restricted to EST major.

**EST343 - IoT OS Platforms** 343-3 Internet of Things (IoT) Operating System Platforms. (Same as ISAT 343) The selection, configuration, installation, maintenance, and troubleshooting of industrial peer-to-peer and device level networks will be examined with the purpose of forming a complete industrial control network structure. The integration of various industrial control devices, components, and automation cells to form a complete automated control system will be examined. Safety and standard practices will be emphasized throughout the course. Students will be required to purchase a microcontroller system ranging in cost between $100-130. Lecture and Laboratory. A grade of C or better is required. Prerequisite: ISAT 327 with a grade of C or better.

**EST350 - Technical Career Subjects** 350-1 to 32 Technical Career Subjects. This course provides the student with in-depth competency and skill development and exploration of innovative techniques and procedures used in business, industry, professions and health service occupations offered through various workshops, special short courses, and seminars. Hours and credits to be individually arranged. This course may be classified as independent study. Special approval needed from the instructor. A grade of C or better is required.

**EST351 - Readings in Elect Systems Tech** 351-3 Readings in Electronic Systems Technologies. The use of written and electronic media resources relevant to electronic systems technologies and the development of an electronic systems technologies research bibliography. The use of bibliographic resources to produce written comparative or persuasive research reports. May be independent study. Prerequisite: EST 300. Restricted to electronic systems technologies majors.

**EST358 - Work Experience Credit** 358-1 to 30 Work Experience Credit. Credit will be granted via departmental evaluation of prior job skills, management-worker relations, and supervisory experience while employed in industry, business, the professions or service occupations. Credit will be established by school director evaluation. This credit may be applied only to the Major Requirements of the Electronic Systems Technologies degree. Restricted to EST major.

**EST365 - Data Apps & Interpretation** 365-3 Data Applications and Interpretation. (Same as ISAT 365) This course will give students an understanding of the basic principles and techniques involved in the statistical treatment of data, including the selection of data sources, the design of statistical studies, and the analysis, synthesis, and utilization of data. Students will gain experience in using data for decision-making in their respective professions. EST majors must earn a grade of C or better. Prerequisite: University Core Curriculum Mathematics with a grade of C or better.

**EST385 - Fiscal Aspects of EST** 385-3 Fiscal Aspects of Electronic Systems Technologies. An introduction to the types of fiscal problems encountered in the electronics industry. The course will
address the diverse sizes and types of business within the field and will include an introduction to the accounting process. Emphasis will be given to financial management systems, financial analysis tools, cash flow management and budgeting procedures. Restricted to electronic systems technologies majors. A grade of C or better is required.

**EST387 - Elect Ind Labor-Mgmt** 387-3 Electronics Industry Labor-Management Relations. A study of economic situations that affect labor-management relations in electronics-related career fields. Study will include the evolution of labor relations in the American electronics industry and interactive differences in labor-management relations from a global perspective. Laws that are common to both union and non-union employees will be emphasized. Restricted to electronic systems technologies majors. A grade of C or better is required.

**EST388 - Legal Aspects of Electronics** 388-3 Legal Aspects of Electronics. An introduction to the types of legal problems encountered in the electronics industry to include American legal heritage and legal rights. The course will emphasize the nature and classification of contracts, warranties, product liabilities, consumer protection and applicable employment laws. Restricted to electronic systems technologies majors. A grade of C or better is required.

**EST401 - Issues in Electronics Industry** 401-3 Analysis of Issues in the Electronics Industry. The identification and study of current economic, regulatory or operational issues impacting the electronics industry. The use of both written and oral reports to present a critical analysis of selected topics. May be independent study. Not for graduate credit. Prerequisite: EST 300. Restricted to electronic systems technologies majors.

**EST404 - Wireless Comms & Security** 404-3 Wireless Communications and Security. (Same as ISAT 417) This course provides a comprehensive overview of wireless communications through an examination of the wireless channel, signal modulation, encoding and transmission techniques, antennae theory and error control. Uses of wireless technologies in local, personal and mobile networks will be examined. An emphasis will be placed on security measures and techniques in wireless communications. A grade of C or better is required. Prerequisite: ISAT 216 and ISAT 224, each with a grade of C or better. Restricted to EST major.

**EST407 - Industrial Control & Security** 407-3 Industrial Control and Security. (Same as ISAT 407) This course provides an in-depth look at control systems and networks particular to industrial processes. Security vulnerabilities and security measures to protect critical system will be explored. Upon completion of this course students will be able to perform risk assessment and make recommendations for threat detection monitoring of industrial control systems. Not for graduate credit. Grade of C or better required. Prerequisite: EST 404 with a grade of C or better.

**EST411 - Imaging & Info Syst Healthcare** 411-3 Imaging and Information Systems in Healthcare. Lecture/Lab. This course discusses radiation, radiographic imaging (X-ray, CT, MRI) and ultrasound. The student will also understand the processes of image formation, manipulation, and enhancement within the framework of a PACS/DICOM Healthcare Information System (HIS). BMET management issues and the use of computerized maintenance management systems will also be covered. Not for graduate credit. Prerequisite: EST 301 and EST 311 or consent of instructor. Co-requisite allowed: ISAT 335 or consent of instructor. Restricted to EST majors or consent of instructor.

**EST420 - EST Coop Education** 420-1 to 12 Electronic Systems Technologies Cooperative Education. Students may participate in a departmentally approved cooperative education program that includes formal instruction, training and/or career-related work experience. Students will receive a salary or wages and engage in prearranged assignments related to their academic program and career objectives. Department faculty evaluation, cooperative agency student performance evaluations and student reports are required. Hours and credit to be individually arranged. Mandatory Pass/Fail. Not for graduate credit. Special approval needed from the instructor.

**EST441 - Career Development** 441-3 Career Development for Electronics Managers. A study of elements to consider when seeking employment in an electronics career field. These elements include personal inventories and resumes, placement service and employment agencies, interviewing techniques, letters of application, references and employment testing. Emphasis will be placed on the roles of mentoring, membership in professional organizations, continuing education and other opportunities for professional growth throughout a career in the electronics industry. Each student will develop a portfolio
including personal and professional information related to individual career goals. Not for graduate credit. Restricted to electronic systems technologies majors. A grade of C or better is required.

**EST450 - Mgmt Problems in Elect Industr** 450-3 Management Problems in the Electronics Industry. The identification and study of problems related to management within the electronics industry. The application of electronic systems technologies theories, concepts and practices to the identified management problems. The use of written and electronic media research resources to produce a written problem solving report. May be independent study. Not for graduate credit. Prerequisite: EST 351 or EST 401. Restricted to electronic systems technologies majors. A grade of C or better is required.

**EST451 - Industry Operations Management** 451-3 Industry Operations Management. Discusses operational management of technical industries. The course covers forecasting, system design, quality, supply chain/inventory management, scheduling, and project management. This course is reading and writing intensive, and reflects the College's Communication-Across-the-Curriculum initiative. Not for graduate credit. Prerequisite: ISAT 365 and ISAT 366 or consent of school. Restricted to senior status in EST.

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Southern Illinois University
Carbondale, IL 62901
Phone: (618) 453-2121

**Catalog Year Statement:**
Students starting their collegiate training during the period of time covered by this catalog (see bottom of this page) are subject to the curricular requirements as specified herein. The requirements herein will extend for a seven calendar-year period from the date of entry for baccalaureate programs and three years for associate programs. Should the University change the course requirements contained herein subsequently, students are assured that necessary adjustments will be made so that no additional time is required of them.