Bachelor of Science in
Industrial Technology
concentration in Computer Electronics Networking Technology (CENT)

Last Updated: July 1, 2013

Advising packet:

List of courses
Course descriptions
List of Eligible Electives
Typical Academic Planner
Course Flowchart
GE Worksheet

Aviation and Technology Department
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# Program Overview for the B.S. Industrial Technology with concentration in Computer Electronics and Network Technology (C.E.N.T.)

## Required Courses in Industrial Technology

### Lower Division Courses  15 units
- **Tech 031:** Quality Assurance and Control
- **Tech 060:** Introduction to Electronics
- **Tech 062:** Analog Circuits
- **Tech 063:** Digital Circuits
- **Tech 065:** Networking Theory and Application

### Upper Division Courses  30 Units
- **Tech 115:** Automation and Control
- **Tech 145:** Lean Manufacturing
- **Tech 160:** Microprocessors Theory and Applications
- **Tech 163:** Telecommunications Systems
- **Tech 165:** Wireless Communications Technology
- **Tech 167:** Control Systems
- **Tech 169:** Applied Electronic Design
- **Tech 190:** Senior Seminar in Technology
- **Tech 198:** Technology and Civilization
- **Engr 100W:** Engineering Reports

### Electives: See current list of eligible electives  8 units

### Required Minor in Business Management  15 Units
- **Bus2 090:** Business Statistics
- **Bus3 142:** Total Quality Management
- **Bus2 186:** Professional and Business Ethics
  and
- **Bus3 140:** Fundamentals of Operations Management, OR
- **Bus3 145:** Global Operations Management
  and
- **Bus3 141:** Materials Management, OR
- **Bus3 144:** Supply Chain Management

### Support Courses  23 Units
- **Chem 1A (5)**
- **Phys 2A and Phys 2B (8)**
- **Math 71 (3)**
- **Econ 1B (4)**
- **CmpE 30 (3)**

Substitutions allowed **ONLY IF** the following courses are completed **BEFORE** becoming an IT major, otherwise the support courses listed above are required.
* Chem 30A and Chem 30B for Chem 1A
** Phys 50 and Phys 51 (8 units) for Phys 2A and Phys 2B
*** Math 30P (5 units) or Math 30 (3 units) for Math 71
**** CmpE 46 (3 units) or CS 049C or CS049J for CmpE 30
Course Descriptions for the BS Industrial Technology with concentration in
Computer Electronics and Network Technology
(C.E.N.T.)

Note: For all prerequisite equivalent / articulated courses are acceptable

Lower Division

Tech 031: Quality Assurance and Control 3
Description: Introduction to concepts and statistical methods that companies use to manage and improve quality. Sampling inspection, statistical process control, quality function deployment, cost of quality, design of experiment and Taguchi’s method for designing in quality. Lecture 2 hours/Lab 3 hours. Prerequisite: BUS2 090.

Tech 060: Introduction to Electronics 3
Description: Emphasizes practical electronics applications and products. DC and AC theory; Ohm's Law, Kirchhoff’s Laws, Power Laws, network theorems, schematic diagrams, Instrumentation and measurement, and functions of discrete components. Lecture 3 hours. Prerequisites: Math 008.

Tech 062: Analog Circuits 3
Description: Semiconductor theory; p-n junction, bipolar transistors, JFETs and MOSFETs, optoelectronic devices. Operational amplifiers and 555 timers. Device applications: comparators, signal generators, active filters, instrumentation amplifiers, voltage regulators and power supplies. Lecture 2 hours/lab 3 hours. Prerequisite: Tech 60, Math 71 or Math 30. Coreq: Phys 2B.

Tech 063: Digital Circuits 3
Description: Logic gates emphasizing TTL and CMOS. Design techniques. Combinational circuits, counters, registers, multiplexers, demultiplexers, encoders, decoders, DAC, ADC and ALU. Lecture 2 hours/lab 3 hours. Prerequisite: Tech 60.

Tech 065: Networking Theory and Application 3

Lower Division Courses total 15 units

Upper Division

Tech 115: Automation and Control 3
Description: Theory and application of automation elements including analog and digital sensors, controllers, indicators, actuators. Control modes for proportional, derivative, and integral control systems. Hands-on integration practices among PLC, robots, automatic identification devices, computers, and other industrial equipment. Lecture 2 hours/lab 3 hours. Prerequisite: Tech 60, Phys 2A/2B, Math 71.

Tech 145 Lean Manufacturing 3
Description: Exploration and practice of techniques for reducing waste to optimize the value stream in both manufacturing and non-manufacturing environments. Toyota Production System, Value Stream Mapping, 7 Wastes, 5S, Just-in-Time, TPM, Kaizen. Prerequisite: Bus3 140 or Bus3 145 or ISE 140.

Tech 160: Microprocessors Theory and Applications 3
Description: Microprocessor concepts and applications to testing and data management. Assembly language and high-level language programming and techniques, including assembling, compiling, debugging. Current trends and issues in microprocessors. Misc/Lab: Lecture 2 hours/lab 3 hours. Prerequisites: Tech 63, Tech 115, CmpE 30.
Tech 163: Telecommunications Systems

Tech 165: Wireless Communications Technology

Tech 167: Control Systems
Description: Theory and applications of feedback systems, transfer functions and block diagrams. Transducers, analog and digital controllers, signal conditioners and transmission. Analysis, testing, and troubleshooting of electronic systems with feedback. Lecture 2 hours/lab 3 hours. Prerequisite: Tech 62, Tech 63, Tech 115.

Tech 169: Applied Electronic Design
Description: Design, test, simulation, development and implementation of electronic systems for control of industrial processes using project management techniques and team work. Hardware, software, and system interfacing. Lecture 2 hours/lab 3 hours. Prerequisites: Tech 167.

Tech 190: Senior Seminar in Technology
Description: Current industry analysis and career development. Technology trends in manufacturing and electronics. Leadership skills for a technology professional. Ethics for technology managers. Lecture 3 hours. Prerequisite: Junior standing, 2-3 semesters before graduation.

Tech 198: Technology and Civilization
Description: History, development, and use of technology in different cultures. Technology's impact on society, global environment, the workplace, cultural values, gender roles, and newly industrialized countries of the world. Lecture 3 hours. Prerequisite: Completion of core GE, satisfaction of Writing Skills Test and upper division standing. For students who begin continuous enrollment at a CCC or a CSU in Fall 2005 or later, completion of, or corequisite in a 100W course is required.

Engr 100W: Engineering Reports
Description: Regular technical writing assignments and company-focused oral presentations while integrating effects of environmental factors as they relate to products, systems and engineering processes. Lecture 3 hours. Prerequisite: ENGL 1B (with a grade of C or better); Completion of core GE, satisfaction of Writing Skills Test and upper division standing.

Electives: Any approved Technical courses selected with your advisor

Upper Division Courses total 38 units

Required Minor in Business Management 15
Support Courses in Math, Chemistry, Physics, Economics, and Computer Science 23

General Education Minimum 29

Units for the degree 120

B. S. Industrial Technology Updated: Fall 2013 Computer Electronics and Network Technology
Technical Electives for the B.S. Industrial Technology

For advising only. Fall 2013

Note: The information below is subject to change without notice. Please see your advisor for the most current information.

Note: The BSIT degree includes 8 units of Technical Electives. Manufacturing Systems students usually need to take at least 4 units of upper division elective units in order to reach the minimum of 40 UD units required by SJSU for graduation, because the required major and minor upper division courses add up to only 36 UD units. The 40 UD units do not need to all be in the major or minor, but it may be the quickest way to graduate if you use your technical electives to get the additional units. CENT students will find that their major and minor courses include 42 required UD units, so they may use upper or lower division courses for their electives.

General Guidelines: If a course is not listed here, it must be approved by your academic advisor. When you gain this approval, be sure to write it into a blank major form and have your advisor sign it, as a record that the courses have been approved. Broadly speaking we are likely to approve most courses in Tech or Engr disciplines that are not already in your major plan.

Tech prefix courses for technical electives:

<table>
<thead>
<tr>
<th>For CENT Majors:</th>
<th>For Manufacturing Systems Majors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tech 45: Sustainable Facilities Design and Planning (Tech 20)</td>
<td>Tech 165: Wireless Communications (Tech 63, 65)</td>
</tr>
<tr>
<td>Tech 46: Machine Operation and Management (Tech 20)</td>
<td>Tech 167: Control Systems (Tech 115)</td>
</tr>
<tr>
<td>Tech 140: Green and Sust Product Desn (Tech 20, Math, Chem)</td>
<td>ISE 151: Managing Engineering</td>
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<tr>
<td>Either concentration: Tech 195 (Internship), Tech 180 (Independent Study) may be used with an approved course plan.</td>
<td></td>
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</tbody>
</table>

Note: Courses listed above count toward elective units ONLY IF they are not already required by your major concentration.

Recommended Courses: Either Concentration

ISE 102: Engineering Economic Systems (3 units) -- Fall
Description: Systems analysis applied to economic decisions in engineering; comparison of alternatives based on cost breakdown structure and time value of money; system life-cycle process; life-cycle economic concepts, costing methodology and applications. Corequisite: MATH 31 and ENGR 10 or equivalent. (Informal for BSIT: Math 71)

ENGR 103: Life Cycle Engineering (also listed as ISE 103, 3 units) -- Spring
Description: Life cycle analysis of products focused on the contexts of reducing energy and the carbon footprint. Methods to analyze and evaluate the environmental impacts of engineering activities. Interdisciplinary case studies and projects related to life cycle engineering. Prerequisites: ENGR 102, ME 172, ISE 105 or METR 135, or instructor approval.

ME 106: Fundamentals of Mechatronics Engineering (3 units) -- Spring and Fall
Description: Foundational concepts in mechatronics including analog and digital electronics, sensors, actuators, microprocessors and microcontroller interfacing to electromechanical systems. Hands-on laboratory experiments with components and measurement equipment used in the design of mechatronic products. Prerequisites: EE 098 and ME 030 (with a grade of 'C-' or better in each). For IT majors: TECH 060, MATH 071, CMPE 046 (with a grade of 'C-' or better in each). Misc/Lab: Lecture 2 hours/lab 3 hours.

MATE 143: Principles of Scanning Electron Microscopy (1 unit) -- Spring and Fall
Description: Principles and practice of scanning electron microscopy. Basic theory and skills development of electron microscopy, including electron dispersive spectroscopy. Imaging and compositional analysis of conductive and non-conductive samples. Prerequisite: Introductory course in chemistry, physics or materials engineering. Misc/Lab: 3 hour lab.

MATE 145: Principles of Scanning Probe Microscopy (1 unit) -- Fall
Description: Principles and practice of various surface probe microscopes including AFM and STM. Prerequisite: Introductory course in chemistry, physics or materials engineering.

For the following courses, instructor approval is recommended prior to registration. (Either Concentration)

ME 168: Microfluidics Fabrication and Design (1 unit)
Description: Hands-on design, fabrication, and testing of microfluidic devices. Processes including photolithography, soft lithography, and plasma bonding. Design problems for microfluidic devices. Introduction to microfluidics simulation. Prerequisite: MATE 025 or MATE 153 or MATE/EE 129.

ME 169: Microelectromechanical Systems Fabrication and Design (1 unit)
Description: Hands-on design, fabrication, and testing of micro electro-mechanical systems (MEMS). Processes including photolithography, etching, and metal deposition applied to MEMS. Design problems for MEMS transducer components. Introduction to MEMS simulation. Prerequisite: MATE 25 or MATE 153 or MATE/EE 129. Misc/Lab: Lab 3 hours.

MATE 129: Introduction to Integrated Circuits Processing and Design (3 units)
Description: Basic processes involved in fabrication of integrated circuits; semiconductor physics, material preparation, oxidation, diffusion; photolithographic, thin-film deposition and etching. Simple component layout and evaluation of device parameters. Prerequisite: MATE 25 or MATE 153. Misc/Lab: Lecture 2 hours/lab 3 hours.
<table>
<thead>
<tr>
<th>Course</th>
<th>Area</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Tech 63</td>
<td>Major</td>
<td>3</td>
</tr>
<tr>
<td>Tech 60</td>
<td>Tech 60, Math 71 or Eng 30</td>
<td>3</td>
</tr>
<tr>
<td>Econ 1A</td>
<td>Major</td>
<td>3</td>
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<tr>
<td>Compe 30</td>
<td>Major</td>
<td>3</td>
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<tr>
<td>GE Area A3</td>
<td>Major</td>
<td>3</td>
</tr>
<tr>
<td>GE Area A1</td>
<td>Major</td>
<td>3</td>
</tr>
</tbody>
</table>

Meet with your advisor each semester.

This sheet is available electronically on the "All Major Forms" page of the Atrich Website.

Student ID Number: [Redacted]
Degree: BS
Major: Industrial Technology Concentration in Computer, Electronic, and Network Technology (CEETN)
5 Year Planner Catalog: FA 2013
San Jose State University
Courses offered in both Fall and Spring Semesters
Courses offered in Spring Semester only
Courses offered in Fall Semester only
Courses meet a USBOR or GE requirement
* Course meets a USBOR or GE requirement
NOTES

First Year
Semester Total: 12
Meeting Units
Spring Semester
Tech Elective
Major
Major
Tech Elective
Tech Elective
Pass WS1, Upper Division Standing
GE 2
GE 2
Tech 169
Bus 414 or 144
Area
Units
Meet with your advisor each semester.

Second Year
Semester Total: 12
Meeting Units
Spring Semester
Tech Elective
Major
Major
Tech Elective
Tech Elective
Pass WS1, Upper Division Standing
GE 2
GE 2
Tech 169
Bus 414 or 144
Area
Units
Meet with your advisor each semester.

Third Year
Semester Total: 12
Meeting Units
Spring Semester
Tech Elective
Major
Major
Tech Elective
Tech Elective
Pass WS1, Upper Division Standing
GE 2
GE 2
Tech 169
Bus 414 or 144
Area
Units
Meet with your advisor each semester.

Fourth Year
Semester Total: 12
Meeting Units
Spring Semester
Tech Elective
Major
Major
Tech Elective
Tech Elective
Pass WS1, Upper Division Standing
GE 2
GE 2
Tech 169
Bus 414 or 144
Area
Units
Meet with your advisor each semester.

Fifth Year
Semester Total: 12
Meeting Units
Spring Semester
Tech Elective
Major
Major
Tech Elective
Tech Elective
Pass WS1, Upper Division Standing
GE 2
GE 2
Tech 169
Bus 414 or 144
Area
Units
Meet with your advisor each semester.

Instructions (how to make this your personalized academic plan):
**Industrial Tech. General Education Worksheet**

**First Name (print) | Last | Student ID #**

**Catalog Year | Major | Minor**

<table>
<thead>
<tr>
<th>General Education Core</th>
<th>Course</th>
<th>Units</th>
<th>Where Taken</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Basic skills (9 units)</strong></td>
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<tr>
<td>A1 Oral Communication *</td>
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<tr>
<td>A2 Written Communication 1A*</td>
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<tr>
<td>A3 Critical Thinking *</td>
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<tr>
<td><strong>B. Science &amp; Math (9 units)</strong></td>
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<td>B1 Physical Science</td>
<td>---Pending Completion of Technology Degree---</td>
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<td>B2 Life Science</td>
<td>---Pending Completion of Technology Degree---</td>
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<tr>
<td>B3 Laboratory Science</td>
<td>---Pending Completion of Technology Degree---</td>
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<tr>
<td>B4 Mathematical Concepts *</td>
<td>---Pending Completion of Technology Degree---</td>
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<td><strong>C. Humanities &amp; Arts (9 units)</strong></td>
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<tr>
<td>C1 Arts</td>
<td>AMS 1A-B</td>
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<td>C2 Letters</td>
<td>AMS 1A-B</td>
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<td>C3 Written Communication 1B</td>
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<td><strong>D. Social Sciences (9 units)</strong></td>
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<td>D1 Human Behavior</td>
<td>Econ 1B</td>
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<tr>
<td>D2 Comparative systems</td>
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<tr>
<td>D3 Social Issues</td>
<td>AMS 1A-B</td>
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<tr>
<td><strong>E. Human Understanding &amp; Development (3 Units)</strong></td>
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<tr>
<td>Engr 10</td>
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**Graduation Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Where Taken</th>
<th>Grade</th>
</tr>
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<tbody>
<tr>
<td><strong>American Institutions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F1 U.S. History</td>
<td>AMS 1A-B</td>
<td></td>
</tr>
<tr>
<td>F2 U.S. Constitution</td>
<td>AMS 1A-B</td>
<td></td>
</tr>
<tr>
<td>F3 California Government</td>
<td>AMS 1A-B</td>
<td></td>
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<tr>
<td><strong>Physical Education Activity (2 courses)</strong></td>
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<tr>
<td>1</td>
<td>Wavied for AY 2014-2015</td>
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<tr>
<td>2</td>
<td>Wavied for AY 2014-2015</td>
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</tr>
</tbody>
</table>

| Prerequisites to SJSU Studies | | |
| Pass Writing Skills Test | Yes | No | |
| Upper Division Standing | Yes | No | |

| **SJSU Studies (Upper Div. GE)** | Course | Units | Where Taken | Grade |
| Area R Earth & environment | | | | |
| Area Z Written Communication II * | ENGR 100w | 3 | SJSU | |
| Area S Self, Society & Equality in the U.S. | | | | |
| Area V Culture, Civilization & Global Understanding | BUS 186 | 3 | SJSU | |
| | TECH 198 | 3 | SJSU | |

Verified by an ESSC Professional Advisor: ____________________________  Date: ___________