ITT Technical Institute

ET4799

Electrical Engineering and Communications Technology Capstone Project

Onsite Course

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 60 (30 Theory Hours, 30 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

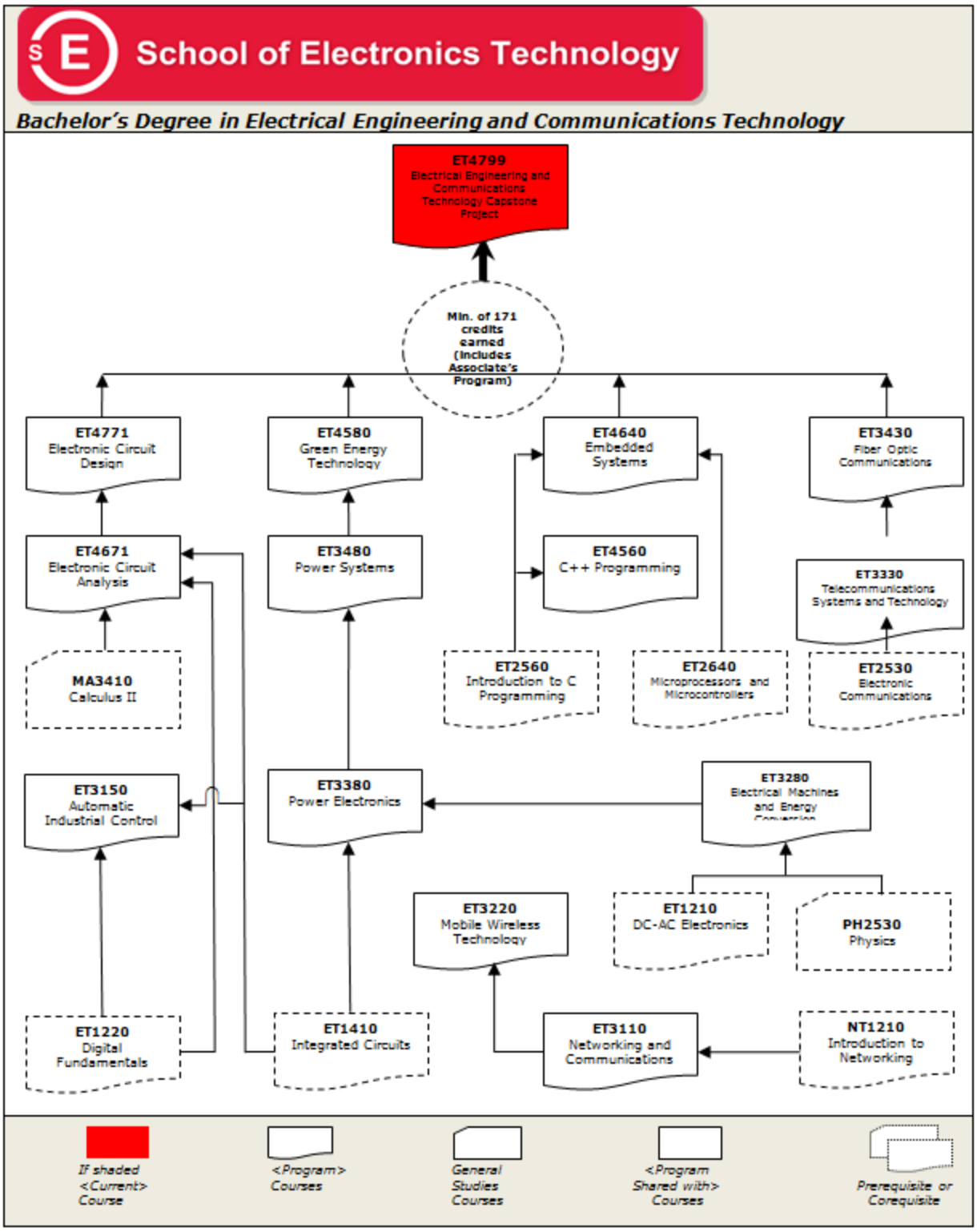
Prerequisites: Completion of a minimum of 171 credits earned in the program of study

Course Description:

This is a project course in which students solve a technical problem that is designed to combine elements of courses in the program. The instructor must approve the scope and depth of the student's project and acts as a resource for the student during the execution of the project. A formal written document and presentation are required.

Where Does This Course Belong?

The following diagram demonstrates how this course fits in the standard program:



NOTE: Refer to the catalog for the state-specific course and program information, if applicable.

This course is required for the Electrical Engineering and Communications Technology program. This program covers the following core areas:

- Circuit analysis and design methods
- Industrial and processor control with programming
- Communications systems
- Power conversion and delivery

Course Summary

Major Instructional Areas

1. Project management techniques
2. A fundamental review of the basics of electronics in the ELCT and EECT programs
3. Capstone project
4. Research of current and emerging technology

Course Objectives

1. Apply important concepts of project management to the actual capstone project proposed for this course.
2. Use Microsoft Project to plan and manage a capstone project.
3. Develop and manage the capstone activities by applying a six-step problem-solving approach.
4. Integrate the knowledge acquired in the program to provide effective technological solutions for given problems.
5. Demonstrate the ability to use team-oriented problem-solving techniques on a large-scope project to arrive at an optimal solution.
6. Demonstrate the ability to document solutions to a problem by applying critical reading, analytical thinking, and resolution skills.
7. Demonstrate the ability to present and defend a proposal in spoken and written formats.
8. Demonstrate the ability to complete a comprehensive skills assessment and fundamental review for the program of study.

Learning Materials and References

Required Resources

Complete Textbook Package	New to this Course	Carried over from Previous Course(s)	Required for Subsequent Course(s)
Metzger, D. L. (2013). *Electronics Pocket Handbook* (Custom 3rd ed.). Boston, MA: Pearson Custom.	■		
Stadtmiller, D. J. (2013). *Electronics Project Management and Design* (Custom 2nd ed.). Boston, MA: Pearson Custom.	■		
All texts previously used in this program		■	
Other Items	**New to this Course**	**Carried over from Previous Course(s)**	**Required for Subsequent Course(s)**
Wood, D., & Pascarella, M. (2012). *Essentials of Microsoft Project 2007 student data files* (Custom 2nd ed.). (D. R. Foley, Ed.) Boston, MA: Pearson Custom.		■	
Student access to Microsoft Office tools (Word, Excel, Visio, PowerPoint)		■	
Student access to Microsoft Project (project planning)		■	
Student access to Multisim (schematic capture and circuit simulation)		■	
Student access to PLC programming software (presently RSLogix®)		■	
Student access to Commsim (communications simulation)		■	
Components kit: Standard student-issued toolkits for ELCT and EECT programs		■	

Recommended Resources

Books, Professional Journals

- Braga, N.C. (2005). *Mechatronics for the evil genius: 15 build-it-yourself projects*. New York, NY: McGraw Hill.
- Horowitz, P. &Hill, W. (1989). *The art of electronics*. Cambridge, UK: Cambridge University Press
- Iannini, B (2004). *Electronic gadgets for the evil genius: 18 build-it-yourself projects*. New York, NY: McGraw Hill.

- IEEE Spectrum
  http://spectrum.ieee.org/
  IEEE Spectrum is a monthly magazine for technology innovators, business leaders, and the intellectually curious. It explores future technology trends and the impact of those trends on society and business
- Journal of the Electrochemical Society
  http://scitation.aip.org/JES/

This peer-reviewed journal publishes papers covering Batteries and Energy Storage, Fuel Cells and Energy Conversion, Semiconductor Devices, Materials, and Processing Sensors and Displays.

- NASA Tech-Briefs
  http://www.techbriefs.com/

Features reports of innovations developed by NASA and its industry partners/contractors that can be applied to develop new/improved products and solve engineering or manufacturing problems.

- Other IEEE Society Journals
  https://www.ieee.org/membership-catalog/subscriptions.html?N=4294927830

A comprehensive listing of additional IEEE electronic engineering publications

- Proceedings of the IEEE
  https://www.ieee.org/membership-catalog/productdetail/showProductDetailPage.html?product=PER501-ELE

A renowned general interest journal covering topics in electrical engineering and computer science.

- The SPIE Optical Engineering Society
  http://spie.org/x867.xml
  A journal highlighting advances in the science and application of light.

Professional Associations

- The American Chemical Society
  http://portal.acs.org/portal/acs/corg/content

ACS is a congressionally chartered independent membership organization which represents professionals at all degree levels and in all fields of chemistry

- The American Institute of Aeronautics and Astronautics
  https://www.aiaa.org/

AIAA works to to advance the state of aerospace science, engineering, technology, operations, and their policies.

- American Institute of Chemical Engineers (AICHE)
  http://www.aiche.org/

The foremost association concerned with applying chemical engineering expertise in meeting societal needs.

- American Society of Mechanical Engineers (ASME)
  http://www.asme.org/

This society works toward a goal of helping the global engineering community develop solutions to benefit lives and livelihoods. It includes more than 120,000 members in over 150 countries worldwide.

- American Society for Quality (ASQ)
  http://asq.org/index.aspx

ASQ champions the cause of quality through a variety of fields and standards. ASQ provides support to groups that develop and approve international and American National Standards. This includes the most widely known standards, such as ISO 9001, ISO 26000, and ISO 14001

- The Electrochemical Society
  http://www.electrochem.org/

ESC advances the theory and practice of electrochemistry, solid-state science, and allied subjects.

- ETA International (Electronic Technician's Association)
  http://www.eta-i.org/

ETA's mission is to represent and support the technical professional. ETA aligns with international standards, vocational and education curriculums.

- The International Society for Optics and Photonics (SPIE)
  http://spie.org/

An organization serving to advance the science and application of light.

- IEEE (The Institute of Electrical and Electronic Engineers)
  http://www.ieee.org/index.html

IEEE is the world's largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity.

- International Project Management Association (IMPA)
  http://ipma.ch/

IPMA is recognized throughout the world as the leading authority on competent project, programme and portfolio management (PPPM).

- Society of Manufacturing Engineers
  http://www.sme.org/

SME is the premier source for manufacturing knowledge, education and networking.

ITT Tech Virtual Library (accessed via Student Portal | https://studentportal.itt-tech.edu)

- Books> Ebrary
  - Erickson, R. (2000). *Fundamentals of power electronics*. Berlin, Germany: Kluwer Academic Publishers.
  - Heldman, K. (2011). *Project management jumpstart* (3rd ed.). Hoboken, NJ: Wiley Publishing, Inc.

- Kishore, L. (2008). *Electronic circuit analysis*. (2nd ed.). Hyderabad, India: BSP Publications.
- Miceli, A. (2003). *Wireless technician's handbook* (2nd ed.). Norwood, MA: Artech House.
- Richman, L. L. (2002). *Project management step-by-step*. New York, NY: AMACOM.
- Sandler, S. (2006). *SPICE circuit handbook*. New York, NY: McGraw Hill Professional Publisher.
- Vine, M. (2002). *C programming for the absolute beginner*. Independence, KY: Course Technology.

- Books> Books24x7
  - Lewis, J. P. (2007). *Fundamentals of project management* (3rd ed.). New York, NY: AMACOM Books.

Other References

- Capterra: Project Management Software Programs
  http://www.capterra.com/landing/psaxproj

A website providing a list of available project management tools

- Cornell University, Designing with Microcontrollers: Final Projects

http://people.ece.cornell.edu/land/courses/ece4760/FinalProjects/

A huge listing of interesting student final capstone projects based on microcontrollers

- Oracle and Primavera

http://www.oracle.com/us/corporate/acquisitions/primavera/index.html

This site offers detailed information about Primavera Project Management software.

This site is an online source for global news and information related to project management.

- PMOUSA.com
  http://www.pmocertified.com/members/pmoc
  A website offering free information to project professionals
- Project Management.com

http://www.projectmanagement.com/

A collection of links to project management resources, tools, and news

- Sources for Electronics Components
  - Alltronics.com

www.alltronics.com

Surplus and low prices

  - Digi-Key Corporation

www.digikey.com

  - Electronic Surplus

http://www.electronicsurplus.com/default.aspx

Parts at surplus prices

- Electronix Express

www.elexp.com

- StartWright Resources

http://www.startwright.com/

A list of project management links

- TenStep Project Management Process

http://www.tenstep.com/

This site describes a methodology for managing work as a project.

- TenStep: The Value of Project Lifecycle Methodology

http://www.lifecyclestep.com/open/401.0Value.htm

A website specializing in developing, consulting, and training in business methodologies

- Wideman Comparative Glossary of Project Management Terms v3.1

  http://www.maxwideman.com/pmglossary/

  A website providing definitions for commonly used terms in project management

NOTE: All links are subject to change without prior notice.

Information Search

Use the following keywords to search for additional online resources that may be used for supporting your work on the course assignments:

- Project management
- Gantt charts
- Critical path
- Prototyping electronics
- Project integration
- Fundamental electronics principles
- Circuit simulation
- Concurrent Engineering
- Testing agencies (UL, TUV, CSA)
- ISO9000
- Burn-in

Suggested Learning Approach

In this course, you will be studying individually and within a group of your peers. As you work on the course deliverables, you are encouraged to share ideas with your peers and instructor, work collaboratively on projects and team assignments, raise critical questions, and provide constructive feedback.

Use the following advice to receive maximum learning benefits from your participation in this course:

DO	DON'T
▪ Do take a proactive learning approach ▪ Do share your thoughts on critical issues and potential problem solutions ▪ Do plan your course work in advance ▪ Do explore a variety of learning resources in addition to the textbook ▪ Do offer relevant examples from your experience ▪ Do make an effort to understand different points of view ▪ Do connect concepts explored in this course to real-life professional situations and your own experiences	▪ Don't assume there is only one correct answer to a question ▪ Don't be afraid to share your perspective on the issues analyzed in the course ▪ Don't be negative about the points of view that are different from yours ▪ Don't underestimate the impact of collaboration on your learning ▪ Don't limit your course experience to reading the textbook ▪ Don't postpone your work on the course deliverables – work on small assignment components every day

Course Outline

Unit 1: INTRODUCTION TO THE CAPSTONE PROJECT: FUNDAMENTAL REVIEW

Upon completion of this unit, students are expected to:

- Describe the difference between a program and a project.
- Identify project roles played within a typical company departmental structure.
- Describe the Project Development Process cycle.
- Explain how a project is managed and evaluated.
- Describe the concept and impact of concurrent engineering practices.
- Examine duties of project managers and twelve management methods.
- Explain the roles of approval agencies such as TUV, UL, CSA, and ISO bodies.
- Open and save a new project in Microsoft Project.
- Create a task list for a new project in Microsoft Project.
- Explain the basics of proposal writing.
- Document individual daily work using the Lab Log method.
- Evaluate potential project ideas and their suitability for a nine-week development effort.
- Demonstrate a high level of knowledge of key technical concepts, such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers.
- Review the technologies taught in the previous courses.

Out-of-class work:
6 hours

READING ASSIGNMENT	• Metzger, Chapter 1.1-1.7, pp. 1-28 • Stadtmiller, Chapters 1-3, pp. 1-65		
OUTSIDE WORK	**Activity**		**Estimated Time**
	Complete the reading assignment		3 hrs.
	Complete the assignment homework		3 hrs.
GRADED ACTIVITIES / DELIVERABLES	**Grading Category**	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
	Assignment	Unit 1 Assignment 1: Problems, Chapters 1-3	0.5%
	Project	Project Documentation Part 1: Potential Project Concepts	2.0%
	Lab	Unit 1 Lab 1: Research Information for Project	2.0%

Unit 2: PLANNING THE PROJECT: PART I

Upon completion of this unit, students are expected to:

- Demonstrate a high level of knowledge of key technical concepts such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers.
- Review the technologies taught in the previous courses.
- Demonstrate the ability to manage project documentation using Microsoft Project.
- Understand the six problem-solving steps applied to conducting projects.
- List the typical deliverables required by a project proposal.
- State the key elements required in a design specification.
- Research design specification information needed to create a proposal.
- Create a feasibility study.
- Explain the inputs and outputs of the capstone project.
- Use appropriate technology to create a block diagram and flowchart to demonstrate what the project will do.
- Demonstrate the use of interpersonal skills and communication techniques.

Out-of-class work:
10 hours

• Demonstrate the ability to use decision-making skills to specify goals and constraints.			
READING ASSIGNMENT	• Metzger, Chapter 3.1-3.4, pp. 91-111 • Stadtmiller, Chapters 4-6, pp. 67-114		
OUTSIDE WORK	**Activity**		**Estimated Time**
	Complete the reading assignment		1.5 hrs.
	Complete the journal homework		.5 hr.
	Complete the assignments homework		3 hrs.
	Prepare for the quiz		5 hrs.
GRADED ACTIVITIES / DELIVERABLES	**Grading Category**	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
	Assignment	Unit 2 Assignment 1: Problems, Chapters 4-6	0.5%
		Unit 2 Assignment 2: Project Feasibility Evaluation (Working Proposal)	0.5%
	Project	Project Documentation Part 2: Initial Project Specifications and Block Diagrams	2.0%
	Journal	Unit 2 Journal 1: Capturing Design Progress	1.0%

Unit 3: PLANNING THE PROJECT: PART II Upon completion of this unit, students are expected to: • Demonstrate a high level of knowledge of key technical concepts such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers. • Review the technologies taught in the previous courses. • Define the three phases needed to manage the project schedule. • Develop a working model for a project based on design specifications. • Demonstrate scheduling the projects from the finish date. • Create a Gantt chart including project milestones. • Create a responsibility matrix to assign and track team responsibilities associated with a project. • Explain a project's critical path and how to manage it. • Describe the typical bottleneck issues encountered in a project. • Create and edit a professionally written project proposal. • Explain the project reporting process. • Describe the project work breakdown structure and proposed schedule. • Enter project resources and cost assignments into Microsoft Project. • Demonstrate fundamental understanding of circuit analysis and design techniques.			***Total outside work:*** 10.5 hours
READING ASSIGNMENT	• Metzger, Chapter 3.8-3.9, pp. 120-134 • Stadtmiller, Chapter 7, pp. 117-139		
OUTSIDE WORK	**Activity**		**Estimated Time**
	Complete the reading assignment		2 hrs.
	Complete the journal homework		.5 hr.
	Complete the assignment homework		3 hrs.
	Prepare for the quiz		5 hrs.
GRADED ACTIVITIES / DELIVERABLES	**Grading Category**	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)

	Assignment	Unit 3 Assignment 1: Problems, Chapter 7	0.5%
	Project	Project Documentation Part 3: Update Project Proposal and Form Initial Schedule	1.5%
	Lab	Unit 3 Lab 1: Creating a Functional Breakdown	2.0%
		Unit 3 Lab 2: The Initial Schematic	2.0%
	Journal	Unit 3 Journal 1: Capturing Design Progress	1.0%
	Quiz	Unit 3 Quiz 1	1.5%

Unit 4: PROJECT PROTOTYPING: PART I

Upon completion of this unit, students are expected to:

- Demonstrate a high level of knowledge of key technical concepts such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers.
- Review the technologies taught in the previous courses.
- Finalize a formal project proposal containing an abstract, introduction, description of functions and features, market analysis, and cost analysis.
- Create technical design considerations from general project requirements.
- Perform a technology assessment of the project requirements.
- Use Microsoft Excel to create a preliminary Bill of Material.
- Use Microsoft Project to budget lead and lag times.
- Use Microsoft Project to resolve resource conflicts.
- Demonstrate fundamental understanding of power electronics and electrical machinery.

Total outside work: 10.5 hours

READING ASSIGNMENT	• Stadtmiller, Chapter 8, pp. 143-180		
OUTSIDE WORK	**Activity**		**Estimated Time**
	Complete the reading assignment		2 hrs.
	Complete the journal homework		.5 hr.
	Complete the assignment homework		3 hrs.
	Prepare for the quiz		5 hrs.
GRADED ACTIVITIES / DELIVERABLES	**Grading Category**	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
	Assignment	Unit 4 Assignment 1: Problems, Chapter 8	1%
	Project	Project Documentation Part 4: Project Proposal, Finalized	2.0%
	Lab	Unit 4 Lab 1: Updated Schematics (Initial Approach)	2.0%
		Unit 4 Lab 2: Initial Bill of Material	2.0%
	Journal	Unit 4 Journal 1: Capturing Design Progress	1.0%
	Quiz	Unit 4 Quiz 2	1.5%

Unit 5: PROJECT PROTOTYPING: PART II

Upon completion of this unit, students are expected to:

- Demonstrate a high level of knowledge of key technical concepts such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers.
- Review the technologies taught in the previous courses.
- Demonstrate engineering tradeoffs made when selecting project components.
- Use Microsoft Word to compose a progress report.
- Use schematic tools to capture proposed circuit designs.

Total outside work: 11 hours

- Use Microsoft PowerPoint to present project details.
- Incorporate charts, block diagrams, and flowcharts in a Microsoft PowerPoint presentation.
- Use the Gantt chart to update project progress and identify the critical tasks.
- Determine appropriate troubleshooting techniques for electronic systems.
- Demonstrate oral presentation skills.
- Demonstrate fundamental understanding of electronic communications.

READING ASSIGNMENT	• Stadtmiller, Chapter 9, pp. 183-228

	Activity	Estimated Time
OUTSIDE WORK	Complete the reading assignment	2.5 hrs.
	Complete the journal homework	.5 hr.
	Complete the assignment homework	3 hrs.
	Prepare for the quiz	5 hrs.

	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
GRADED ACTIVITIES / DELIVERABLES	Assignment	Unit 5 Assignment 1: Problems, Chapter 9	1%
	Project	Project Documentation Part 5: Comprehensive Project Report	2.0%
	Lab	Unit 5 Lab 1: Component Selection Analysis	2.0%
		Unit 5 Lab 2: Draft PowerPoint Presentation	2.0%
	Journal	Unit 5 Journal 1: Capturing Design Progress	1.0%
	Quiz	Unit 5 Quiz 3	1.5%

Unit 6: PROJECT PROTOTYPING: PART III

Upon completion of this unit, students are expected to:

- Demonstrate a high level of knowledge of key technical concepts such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers.
- Review the technologies taught in the previous courses.
- Understand component sourcing and procurement procedures.
- Track project progress using a Gantt chart timeline, task deadlines, and prototyping milestones for the project.
- Review common breadboarding methods and materials.
- Modify design approaches or bill of material to counteract sourcing difficulties.
- Analyze the cost of the project and fit it to a budget.
- Demonstrate the use of technicians' tools and equipment in constructing a prototype.
- Document prototype performance against design specifications.
- Evaluate project design robustness.
- Demonstrate fundamental understanding of programming and embedded systems.

Total outside work: 10.5 hours

READING ASSIGNMENT	• Stadtmiller, Chapter 10, pp. 233-266

	Activity	Estimated Time
OUTSIDE WORK	Complete the reading assignment	2 hrs.
	Complete the journal homework	.5 hr.
	Complete the assignment homework	3 hrs.

	Prepare for the quiz		5 hrs.
GRADED ACTIVITIES / DELIVERABLES	**Grading Category**	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
	Assignment	Unit 6 Assignment 1: Problems, Chapter 10	1.0%
		Unit 6 Assignment 2: Progress Report—Update	1.0%
	Project	Project Documentation Part 6: Project Cost Analysis	2.0%
	Lab	Unit 6 Lab 1: Demonstrate Prototype Construction Progress	2.0%
		Unit 6 Lab 2: Evaluate Design Robustness	2.0%
	Journal	Unit 6 Journal 1: Capturing Design Progress	1.0%
	Quiz	Unit 6 Quiz 4	1.5%

Unit 7: FINAL ASSEMBLY: PART I

Upon completion of this unit, students are expected to:

- Demonstrate a high level of knowledge of key technical concepts such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers.
- Review the technologies taught in the previous courses.
- Incorporate charts, block diagrams, and flowcharts in a Microsoft PowerPoint presentation.
- Discuss the considerations and methods for circuit board design and fabrication.
- Illustrate methods of prototype environmental testing.
- Prepare a final proposal containing technical information, task allocation, a weekly Gantt chart, and a testing procedure.
- Demonstrate implementing and documenting prototype refinements.
- Demonstrate how to use the Gantt chart to effectively manage deadlines and the critical path.
- Demonstrate fundamental understanding of networking and wireless technologies.

Total outside work: 10.5 hours

READING ASSIGNMENT	• Stadtmiller, Chapter 11, pp. 269-306		
OUTSIDE WORK	**Activity**		**Estimated Time**
	Complete the reading assignment		2 hrs.
	Complete the journal homework		.5 hr.
	Complete the assignment homework		3 hrs.
	Prepare for the quiz		5 hrs.
GRADED ACTIVITIES / DELIVERABLES	**Grading Category**	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
	Assignment	Unit 7 Assignment 1: Problems, Chapter 11	1.0%
	Project	Project Documentation Part 7: Updated PowerPoint Presentation	1.5%
	Lab	Unit 7 Lab 1: Initial Prototype Modifications	2.0%
		Unit 7 Lab 2: Prototype Environmental Test	1.0%
	Journal	Unit 7 Journal 1: Capturing Design Progress	1.0%
	Quiz	Unit 7 Quiz 5	1.5%

Unit 8: FINAL ASSEMBLY: PART II

Upon completion of this unit, students are expected to:

Total outside work: 10 hours

- Demonstrate a high level of knowledge of key technical concepts such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers.
- Review the technologies taught in the previous courses.
- Finalize a functioning solution that meets project requirements.
- Discuss the use of burn-in and product life testing methods.
- Draft a project test procedure that meets project specifications.
- Describe the considerations needed to transfer a project to manufacturing.

READING ASSIGNMENT	• Stadtmiller, Chapter 12, pp. 315-338		
OUTSIDE WORK	**Activity**		**Estimated Time**
	Complete the reading assignment		1.5 hrs.
	Complete the journal homework		.5 hr.
	Complete the assignment homework		3 hrs.
	Prepare for the quiz		5 hrs.
GRADED ACTIVITIES / DELIVERABLES	**Grading Category**	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
	Assignment	Unit 8 Assignment 1: Problems, Chapter 12	1.0%
	Project	Project Documentation Part 8: Draft of Final Report	1.5%
	Lab	Unit 8 Lab 1: System Hardware and Software Integration	1.0%
		Unit 8 Lab 2: Finalize Project Test Procedure	1.0%
	Journal	Unit 8 Journal 1: Capturing Design Progress	1.0%
	Quiz	Unit 8 Quiz 6	1.5%

Unit 9: FINAL ASSEMBLY: PART III

Upon completion of this unit, students are expected to:

- Demonstrate a high level of knowledge of key technical concepts such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers.
- Review the technologies taught in the previous courses.
- Evaluate and revise a final solution that meets project requirements.
- Use Microsoft Excel to finalize the project Bill of Materials.
- Finalize a project test procedure to validate proper operation.
- Discuss methods and metrics to evaluate the overall success of a project.
- Build and test the project against requirements documentation.
- Investigate alternative ways to effectively present technical material.
- Design a formal presentation that demonstrates engineered solutions that meet all project requirements.

Total outside work: 10.5 hours

READING ASSIGNMENT	• Stadtmiller, Chapter 13, pp. 343-356		
OUTSIDE WORK	**Activity**		**Estimated Time**
	Complete the reading assignment		2 hrs.
	Complete the journal homework		.5 hr.
	Complete the assignment homework		3 hrs.
	Prepare for the quiz		5 hrs.
GRADED ACTIVITIES / DELIVERABLES	**Grading Category**	**Activity/Deliverable Title**	**Grade Allocation**

			(% of all graded work)
	Assignment	Unit 9 Assignment 1: Problems, Chapter 13	1.0%
	Project	Project Documentation Part 9: Integrate Formal Presentation Components	1.5%
	Lab	Unit 9 Lab 1: Build, Test, and Modify Final Project	1.0%
	Journal	Unit 9 Journal 1: Capturing Design Progress	1.0%
	Quiz	Unit 9 Quiz 7: Industrial Systems	1.0%

Unit 10: PRESENTATION REHEARSAL AND FINAL FUNDAMENTALS REVIEW

Upon completion of this unit, students are expected to:

- Demonstrate a high level of knowledge of key technical concepts such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers.
- Review the technologies taught in the previous courses.
- Demonstrate project development testing skills.
- Manage unexpected project deficiencies with alternative approaches.
- Present a draft copy of the final project presentation.
- Understand good business and professional presentation skill expectations.

Total outside work: 9 hours

READING ASSIGNMENT	• None		
OUTSIDE WORK	**Activity**		**Estimated Time**
	Complete the journal homework		1 hr.
	Complete the assignment homework		3 hrs.
	Prepare for exams		5 hrs.
GRADED ACTIVITIES / DELIVERABLES	**Grading Category**	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
	Assignment	Unit 10 Assignment 1: Design Review and Lessons Learned	1.0%
	Lab	Unit 10 Lab 1: Demonstrate Project Testing	1.0%
	Journal	Unit 10 Journal 1: Capturing Design Progress	2.0%
	Exam	Unit 10 Exam 1	5.0%
		Unit 10 Exam 2	5.0%

Unit 11: CAPSTONE PRESENTATION

Upon completion of this unit, students are expected to:

- Demonstrate a high level of knowledge of key technical concepts such as DC/AC circuits, electronic devices, digital circuits, and microcontrollers.
- Review the technologies taught in the previous courses.
- Incorporate charts, block diagrams, and flowcharts into a Microsoft PowerPoint presentation.
- Demonstrate oral presentation skills.
- Use Microsoft Word to finalize the final project report.
- Illustrate professional dress and teamwork.
- Defend the project against critical evaluation.
- Combine all project materials as a single coordinated deliverable.

Total outside work: 10 hours

<table>
<tr><td>READING ASSIGNMENT</td><td colspan="3">• None</td></tr>
<tr><td rowspan="3">OUTSIDE WORK</td><td colspan="2">Activity</td><td>Estimated Time</td></tr>
<tr><td colspan="2">Complete the project homework</td><td>5 hrs.</td></tr>
<tr><td colspan="2">Complete the presentation homework</td><td>5 hrs.</td></tr>
<tr><td rowspan="3">GRADED ACTIVITIES / DELIVERABLES</td><td>Grading Category</td><td>Activity/Deliverable Title</td><td>Grade Allocation (% of all graded work)</td></tr>
<tr><td>Presentation</td><td>Unit 11 Presentation: Presentation of Project and Functional Demonstration</td><td>15%</td></tr>
<tr><td>Project</td><td>Project Documentation Part 10: Release Final Project Report (PORTFOLIO)</td><td>4%</td></tr>
</table>

Note: Your instructor may add a few learning activities that will change the grade allocation for each assignment in a category. The overall category percentages will not change.

Evaluation and Grading

Evaluation Criteria

The graded assignments will be evaluated using the following weighted categories:

Category	Weight
Assignment	10%
Lab	25%
Project	20%
Journal	10%
Presentation	15%
Quiz	10%
Exam	10%
TOTAL	**100%**

Grade Conversion

The final grades will be calculated from the percentages earned in the course, as follows:

Grade	Percentage
A (4.0)	90–100%
B+ (3.5)	85–89%
B (3.0)	80–84%
C+ (2.5)	75–79%
C (2.0)	70–74%
D+ (1.5)	65–69%
D (1.0)	60–64%
F (0.0)	<60%

Academic Integrity

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct, including plagiarism, self-plagiarism, fabrication, deception, cheating, and sabotage. For more information on the academic honesty policies, refer to the Student Handbook and the Course Catalog.

(End of Syllabus)