

**NEW YORK CITY COLLEGE OF TECHNOLOGY**  
**The City University of New York**

**DEPARTMENT:** Electrical and Telecommunication  
Engineering Technology

**SUBJECT CODE** EET 2171/ET 351  
**AND TITLE:** Projects Laboratory

**COURSE DESCRIPTION:** A basic course in the use of specialized tools and fabrication techniques as related to electrical and electronic circuit fabrication, with simulation software. Layout and fabrication of printed circuits are covered.

**PREREQUISITES:** EET 1202/ET 205/ET351, EET 1241/ET 252

**TEXTBOOK:** Electronic Projects Design and Fabrication  
Ronald A. Reis

**COURSE OBJECTIVES/  
COURSE OUTCOMES:** Upon completion of this course students will possess the ability to:

1. Build an Analog electronic project using tools and fabrication techniques as related to electrical and electronics construction (ABET 2a, 2c, 2d, 2f, 2k, 2l, 2m).
2. Analyze the completed project and have a good understanding of project operation (ABET 2a, 2c, 2d, 2f, 2k).
3. Learn and practice of the troubleshooting techniques by using Multisim Simulator Software to analyze and calculate the required parameters based on information from the project's schematics drawing (ABET 2a, 2b, 2c, 2d, 2f, 2j, 2k, 2l).
4. Develop test procedure and measure the required parameters using necessary equipment and to evaluate them with the calculated ones (ABET 2a, 2b, 2c, 2d, 2f, 2g, 2k, 2l, 2m).

**TOPICS:** Topics include electrical safety in working environment, printed circuit building process, PCB layout design, PCB artwork, photo engraving, PCB etching, wiring, soldering, troubleshooting, testing, measurement of related parameters, and writing a technical report.

**LAB HOURS:** 3

**CREDITS:** 1

**Prepared by:** Professor N. Barhordar  
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**GRADING POLICY:** EET 2171/ET 351

Practice Board	20%
Final Project Functionality	15%
Test Procedure and Required Measurements	15%
Final Project PCB and Box Assembly	15%
Final Report	25%
Attendance and Promptness of each Phases	10%

<u>Letter Grade</u>	<u>Numerical Grade Ranges</u>	<u>Quality</u>
A	93-100	4.0
A-	90-92.9	3.7
B+	87-89.9	3.3
B	83-86.9	3.0
B-	80-82.9	2.7
C+	77-79.9	2.3
C	70-76.9	2.0
D	60-69.9	1.0
F	59.9 and below	0.0

WEEK	TOPIC	READING ASSIGNMENT
1	Course description, Safety, Classroom policy	Chapter 1
2	<b>Practice Board and project selection</b> 1. PC Layout; Initial free hand layout for practice board, Size to components 2. Photoengraving process: Cleaning and degreasing Photo sensitizing, Use of dry transfer for traces and pads, Project selection	Chapter 2
3	1. Etching (Practice Board): Solution, Using etching tank, Etching time, Rinsing	Chapter 6.2
4	1. Assembly (Practice Board): Drilling holes. Inserting components. 2. Soldering: Soldering iron, Rating, Tips, Cleaning, Tinning, Heat, Solder composition, Lead free solder, Testing (Practice Board).	Chapter 7
5	<b>Project Box</b> 1. Box layout: Box type, Box size, Positioning of controls, Positioning of LED and bulbs, Positioning of large components such as speakers or transformers.	Chapter 8
6	<b>Project PCB layout</b> 1. PC Layout: Initial free hand layout, Size to components. 2. Photoengraving process: Cleaning and degreasing, Photo sensitizing, Use of dry transfer for traces and pads.	
7	<b>Project etching:</b> Solution, Using etching tank, Etching time, Rinsing.	
8	Projects Soldering 1. Assembly: Drilling holes, Inserting components. 2. Soldering: Soldering iron, Rating, Tips, Cleaning, Tinning, Heat, Solder composition, Lead free solder.	Chapter 9
9	<b>Projects Soldering</b> 1. Assembly: Drilling holes, Inserting components 2. Soldering, Soldering iron, Rating, Tips, Cleaning, Tinning, Heat, Solder composition, Lead free solder.	
10 & 11	<b>Project assembly and final construction</b> 1. Mounting the PC board into the box. 2. Installing the transformer and speaker. 3. Installing LEDs. 4. Installing controls and switches. 5. Final wiring of PC board.	Chapter 10
12 & 13	<b>Project test and troubleshooting</b> 1. Test procedure: Digital Multimeter, Oscilloscope, Signal Generator 2. Measurement: DC Voltage, AC Voltage, Input and Output, Frequency, Gain, Output Power. 3. Troubleshooting	Chapter 5
14 & 15	<b>Presentation and Report</b> 1. Submission of the report. 2. Presentation of the final working project. 3. Answering to the questions.	