NEW YORK CITY COLLEGE OF TECHNOLOGY
CITY UNIVERSITY OF NEW YORK

DEPARTMENT: ELECTRICAL AND TELECOMMUNICATIONS ENGINEERING TECHNOLOGY

SUBJECT CODE AND TITLE: EET2220 - ELECTRONIC CONTROLS

COURSE DESCRIPTION The course introduces discrete & continuous control systems. Open & closed loop systems are analyzed. The use of semi-conductors, operational amplifiers programmable logic controllers and other topics are discussed.

PREREQUISITES: EET2120 and MAT 1475

REQUIRED TEXTBOOK: **Control Systems Technology** by: Curtis Johnson & Heidar Malki, PRENTICE HALL, 2002

REFERENCE BOOK: **Modern Industrial Electronics** **By: Timothy J. Maloney** PRENTICE HALL, 5th edition

COURSE OBJECTIVES/ COURSE OUTCOMES

Upon completion of this course the students will be able to:

1) Understand basic applications of amplifiers, SCR, Triac, PLC, and their implementation in Control systems (3.1)
2) Analyze systems using Differential equations and Laplace transforms (3.1, PC b)
3) Utilize block diagrams to find transfer functions (3.1, PC a)
4) Characterize closed-loop control system including steady-stateand transient response, disturbances, error (3.1, PC b)
5) Introduce students to the basic concepts of proportional, integral, and derivative (3.1, PC a)

TOPICS:

- Introduction to Control Systems
- Laplace transformation
- Frequency Response Analysis
- Concept of Feedback Systems
- Op-Amp, SCR and Triac, PLC and their applications

CLASS HOURS: 3
CREDITS: 3

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Spring 2020
Revised by: Spring 2022
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EET2220 ELECTRONIC CONTROLS

Contribution of course to meeting the requirements of Criterion 5:
EET2220 meets Criterion 5 by providing students with a solid foundation of the theoretical principles and practices used in modern electronic control systems. Academic benchmarks, course outcomes, and assessment requirements are defined to measure student understanding of concepts, hardware, and functionality using block diagrams and component integration found in analog and digital control systems.

Relationship of course to Program Outcomes:
EET2220 contains relevant components to Program Outcomes (1,2,6).

Grading Policy: EET2220/ET432

EXAM # 1 30 %
EXAM # 2 30 %
FINAL 30 %
HW & 10 %
CLASS PRESENTATION OF PROBLEMS

LETTER GRADE	NUMERICAL GRADE RANGES	QUALITY
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	1.0
F	59.9 and below	0.0

COURSE OBJECTIVES	ASSESSMENT
1) Understand how control of the rapid expansion of modern industrial manufacturing is met by electronic devices.	**After completing the reading assignment, homework problems and their presentation in class, the student should be able to understand:** **1.1 How Transistors, Relays & Logic Gates perform decision-making.** **1.2 How SCRs and TRIACs are used in Industrial Control.** **1.3 The various configurations of Operational Amplifiers**
2) A Knowledge of How Modern Industrial Controls use these devices to provide more precise control over machines and processes.	**2.1 Explain the difference between open and closed loop systems** **2.2 Understand the basic operation and differences between methods of Control such as: On-Off, Proportional, etc.** **2.3. Explain how Operational Amplifiers are used in Motor speed control.** **2.4 Be able to Identify the components and logic of a Relay Ladder Network as applied to a Conveyer Belt and Classifying System** **2.5 Identify the parts of a Programmable Logic Controller (PLC)** **2.6 Convert the Relay Logic Ladder in 2.4 to a PLC System to perform the same Conveyer Belt System function.**

EET2220 - ELECTRONIC CONTROLS

WEEK	LECTURE TOPIC (S)	READING ASSIGNMENT FOR FOLLOWING WEEK	PROBLEMS FOR FOLLOWING WEEK
1	• Operational Amplifiers, Basic Inverting Amplifier, • Non-Inverting Amplifier • OP-AMP Summing Circuit, • OP AMP Differential Amplifier • OP AMP Integrators & Differentiators	**Reference Book** Chapter: 8 • P. 310 – 313, 331 & 332 Sec. 8-7, 8-8, 8-9 & 8-13	• CH 8 P. 342 # 7, 8, 13 – 18
2	• Introduction • Analytical Descriptions • Concept of Block diagram (Open Loop and closed Loop) • Transfer Function • System Design Objectives	• Chapter 1 P. 2 – 17, Sec. 1.1-1.5,	CH 1 P. 21 # 1.6-1.12
3	• Measurement Principles • Sensors and Signal Conditioning • Temperature sensor • Displacement sensor • Motion sensor	• Chapter 2 P. 24 – 45 Sec. 2.2.1-2.3.3	• CH 2 p. 48 # 2.1 – 2.13
4	• Laplace Transforms • Properties of Laplace Transform • Inverse Laplace Transforms	• Chapter 3 P. 52 – 77 Sec. 3.1 thru 3.5	• CH 3 P. 89 # 3.1 – 3.10
5	• Control System Models • Transfer Functions • Block Diagrams • Controller (Proportional, Integral and Derivative)	• Chapter 4 P. 94 – 129 Sec. 4.2.1 thru 4.5.1	• CH 4 P. 134 # 4.6 – 4.17
6	**EXAM # 1**		
7	• Static and Dynamic Response • Steady-state Error • Disturbance Error • First & Second-Order Plant • Steady-State Error Versus Stability	• Chapter 5 P. 140 -165 Sec. 5.1 thru Sec 5.5	• CH 5 P. 168 # 5.2 – 5.13
8	• Stability • Definition of Stability	• Chapter 6 P. 174– 178 Section 6.1 thru 6.3	• CH 6 P.185 # p 6.1-6.11

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WEEK	LECTURE TOPIC (S)	READING ASSIGNMENT FOR FOLLOWING WEEK	PROBLEMS FOR FOLLOWING WEEK
9	• Frequency Response Analysis • Basic Principles • Control system Bode Plots • Bode Plot Application	• Chapter 7 P.188 – 210, Sect. 7.1 Thru 7.4	• CH 7 P. 217 # 7.1- 7.9
10	**EXAM # 2**		
11	• SCR Characteristics • SCR's In DC Circuits • Triacs Basic Operation • Triggering Triac Circuits	**Reference Book** • Chapter 6 P.219 – 223 Sect. 6-1,thru 6-3 • Chapter 1 P. 1 –11, 19 –22 Section 1-1, THRU 1-5, 1-8 & 1-9	• CH 4 P. 181 # 1- 18 • CH 6 P. 245 # 1- 9
12	• Introduction To Software controlled Systems. THE PLC • Transistors & Electro Mechanical Switches As Decision Makers	**Reference Book** • CH 3, P 78-89, 95-102 SEC. 3-1-2 TO 3-3	• CH 1 P. 31 # 1 – 13
13	• Basic Design of PLCs. • Functions & Function Blocks		• CH 3 # 3 – 15, 23 - 27
14	**FINAL EXAM REVIEW**	• **Prepare For Final**	
15	• **Final Exam**		

New York City College of Technology Policy on Academic Integrity

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College Policy on Academic Integrity may be found in the catalog.