New Paltz
STATE UNIVERSITY OF NEW YORK

**Division of Engineering Programs**

# EGC220 Digital Logic Fundamentals
# (3 credits*)
# Spring 2023 Semester

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## 1. Course Information

**Course Number:** EGC220
**Course Title:** Digital Logic Fundamentals
**No. of Credits:** 3
**Time on Task:** 135 hours
**Course Designation:** Undergraduate
**Teaching Modalities:** Hybrid - Seated with online elements
**Meeting:** TF 2:00 PM - 3:15 PM, Wooster 221
**Course Website:** http://www.engr.newpaltz.edu/~bai/EGC220/EGC220_fall.html

**Pre-requisites:** Students must successfully earn a grade of "C-" or better in all of the following (or equivalent) prior to taking this course

- MAT251 Calculus I
- EGC221 Digital Logic Lab (Co-requisite)

**Catalog Description**

An introduction to digital logic analysis and design. Topics include number representations used in today's digital systems and their arithmetic properties and conversion techniques; combinational switching theory of digital element networks where no feedback is present; analysis and design of clocked sequential circuits where feedback is present; and an introduction to modern programmable logic devices and their programming and synthesis techniques.

**Reading Materials**

"*Digital Design*," online textbook by ZyBooks. Every student is required to subscribe within the first week. The book will be used partially to assign homework.

1. Sign in or create an account at learn.zybooks.com
2. Enter zyBook code: NEWPALTZEGC220IzadiSpring2023
3. Subscribe

A subscription is **$58**. Students may begin subscribing on Jan 09, 2023 and the cutoff to subscribe is May 09, 2023. Subscriptions will last until Jun 08, 2023.

**References:**

- *"Logic and Computer Design Fundamentals,"* **4th Edition**, by M. Mano and C. Kime, Prentice Hall, Upper Saddle River, NJ, 2008

- *"Digital Design"* 3rd Edition by J. F. Wakerly, Prentice Hall, Upper Saddle River, NJ, 2000.
- "*Digital Principles,*" 3rd Ed, Roger L. Tokheim, Schaum's Outline Series, McGraw-Hill Publ, 1994 [contains many worked out examples]

## 2. Instructor Information

Dr. Baback Izadi
*Associate Professor of Electrical and Computer Engineering*

213 Resnick Engineering Hall
bai@engr.newpaltz.edu
http://www.engr.newpaltz.edu/~bai

(845) 257-3823 Office
(845) 257-3720 Engineering Secretary's Office

**Office Hours**

- Tuesday and Friday 11:00 AM – 12:30 PM
- Wednesday 2:00 PM – 3:00 PM

I will hold regular office hours using WebEx link to help with your issues and concerns. Please reserve a 10 minutes time slot using https://calendly.com/izadibaback. Subsequently, on the scheduled time, you should use the Office Hour tab on the course website (http://www.engr.newpaltz.edu/~bai/hours.htm) and use the given WebEx link https://newpaltz.webex.com/meet/izadib

## 3. Learning Outcomes

### Student Outcomes (SO)

Student outcomes represent the desired knowledge and skills that Engineering students must have acquired by the time of graduation. All of our Engineering Programs have adopted ABET Criterion 3 as guiding student outcomes, as specified below.

By the time of graduation, engineering students must have demonstrated an ability to:

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. communicate effectively with a range of audiences
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

### Student Learning Outcomes (SLO)

Upon successful completion of this course students will have demonstrated an ability to:

I. Students will learn to demonstrate their ability to analyze, synthesize, and design networks of combinatorial digital logic elements, and digital clocked sequential circuits.

**Contributions**

| SO | SLO | Level |
|---|---|---|
| 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics | I | Medium |

## 4. Course Contents and Procedure

The course is in hybrid format. Before attending each lecture, **you are required** to watch the assigned lecture videos in Brightspace and do the assigned problems. During the lecture, we will discuss issues and answer questions. At the end of the lectures, you will take a short quiz.

- Course contents is organized into 45 lecture videos. They will become available in a timely manner in Brightspace under Lecture Videos. You must watch the assigned videos for the day before the lecture day and attempt the assigned problem set.
- Solutions to problem set (Class Notes) will be available on the day of the scheduled lecture by 8 AM. During the class time, we will discuss any issue with the lecture or problem sets.
- You are expected to take a quiz at 2:45 PM on the day of scheduled lecture. You will be given 20 minutes to take the quiz, plus 10 minutes to convert the solution to a single PDF document and submit your solution via Brightspace HW/Test/Quiz.
- Homework assignments need to be submitted in PDF format via Brightspace HW/Test/Quiz link. Zybook assignments need to be submitted via Zybook website.
- Exams will be submitted via Brightspace. You will need to login with a live camera on you and your exam paper while taking the test.
- All homework, quiz, and test solutions need to be submitted to Brightspace HW/Test/Quiz link in a single PDF. One option is using Camscanner (https://www.camscanner.com/disclaimer/educator)

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## Division of Engineering Programs

| Lecture Date | Lecture Note in Course Website | Lecture Video on ***Brightspace*** | Required Additional Activities |
|---|---|---|---|
| 1/24/2023 | Overview & Class policy | | |
| 1/27/2023 | 1-Number systems | Lectures 1 & 2 | Read text Chaper 1, Try Problems 1 |
| 1/31/2023 | 1-Number systems | Lectures 3 & 4 | Read text Chaper 1, Try Problems 2 |
| 2/3/2023 | 1-Number systems | Lectures 5 &6 | Read text Chaper 1, Try Problems 3 |
| 2/7/2023 | 2 - Boolean Logic | Lectures 7 & 8 | Read text Chapter 2, see sample operations, Try Problem 4 |
| 2/10/2023 | 3 - Boolean Logic Functions | Lectures 9 & 10 | Read text Chapter 2, Try Problem 5 |
| 2/14/2023 | 3 - Boolean Logic Functions | Lectures 11 & 12 | Read text Chapter 2, Try Problem 6 |
| 2/17/2023 | 3 – All NAND Implementation | Lectures 13 & 14 | Read text Chapter 2,Try Problem 7 |
| 2/21/2023 | 4-Simplification Using K-Map | Lectures 15 & 16 | Read Text Chapter 3,Try Problem 8 |
| 2/24/2023 | 4-Simplification Using K-Map | Lectures 17 & 18 | Read Text Chapter 3,Try Problem 9 |
| 2/28/2023 | 5-Design of Combinational Circuits | Lectures 19 & 20 | Read Text Chapter 3,Try Problem 10 |
| 3/3/2023 | **Test 1** | | Practice Problems |
| 3/7/2023 | 5-Design of Combinational Circuits | Lectures 21& 22 | Read Text Chapter 3, Try Problem 11 |
| 3/10/2023 | Design of Decoders | Lectures 23 & 24 | Read Text Chapter 3, Try Problem 12 |
| 3/24/2023 | Design of Encoder / Mux/ DeMux | Lectures 25 & 26 | Read Text Chapter 3, Try Problem 13 |
| 3/28/2023 | 6- Programmable Logic Devices | Lectures 27 & 28 | Try Problem 14 |
| 3/31/2023 | 7- Design Using Verilog | Lectures 29 & 30 | Read Text Chapter 4, Try Problem 15 |
| 4/4/2023 | 7- Design Using Verilog<br>8- Latches | Lectures 31 & 32 | Read Text Chapter 5, Try Problem 16 |
| 4/11/2023 | 8- Flip-flops and Ripple Counters | Lectures 33 & 34 | Read text Chaper 5 & Try Problem 17 |
| 4/12/2023 | 8- Asynchronous and Synchronous Circuits | Lectures 35 & 36 | Read text Chaper 5 & Try Problem 18 |
| 4/14/2023 | 8- Analysis of Sequential Circuits | Lectures 37 & 38 | Read text Chaper 5 & Try Problem 19 |
| 4/18/2023 | **Test 2** | | Practice Problems |
| 4/21/2023 | 8- Design of Sequential Circuits | Lectures 39 & 40 | Read Text Chapter 5, Try Problem 20 |
| 4/25/2023 | 8- Sequential Circuits | | Read Text Chapter 5, Try Problem 20 |
| 4/28/2023 | 8- Verilog in Sequential Circuits | Lectures 41 & 42 | Read Text Chapter 5, Try Problem 21 |
| 5/2/2023 | 8- Design of Finite State Machine | Lectures 43 & 44 | Try Problem 22 |
| 5/5/2023 | 8- Design of a Controller | Lectures 45 | Read Text Chapter 5, Try Problem 23 |
| 5/9/2023 | **Review** | | |
| 5/16/2023 | **Final Exam** | | 12:30 PM – 2:30 PM |

# 5. Grading

## Assessments and Weights

| | |
|---|---|
| ZyBook Assignments | 40 Points |
| Homework | 60 Points |
| Quizes* | 200 Points |
| 2 Tests | 200 Points |
| Final | 100 Points |
| **Total** | **600 Points** |

*The lowest 5 quiz grades will be dropped. These include missed quiz for even legitimate absences, i.e. illness, religious days, black solidarity. Hence, there will not be any makeup quiz.

## Grading Schema

| Total Points | Final Grade |
|---|---|
| 540 – 600 | A |
| 528 – 539 | A- |
| 511 – 527 | B+ |
| 480 – 510 | B |
| 465 – 479 | B- |
| 449 – 464 | C+ |
| 420 – 448 | C |
| 406 – 419 | C- |
| Below 406 | F |

# 6. Rules and General Comments:

- Please note the date and time of tests and the final and ensure you do not schedule any event that would cause a conflict. Each examination and its format will be confirmed one week prior. If a conflict is unavoidable, you must bring it to the instructor's attention as soon as possible. Once you begin an exam, no makeup or other score adjustments will be permitted.
- Homework assignments will be posted on the course web site and will be collected using Brightspace. The due date is typically one week from the distribution date. No late homework set is accepted except under extreme non-academic condition and with the prior approval of the instructor.
- **Attendance**: I strongly advise against missing any classes. If you miss a class, it is your responsibility to obtain assignments and other information given on that day. Three missing classes are allowed. However, you will lose 2% of your grade if you miss a fourth class and 5% after the seventh absence.
- All your coursework (homework, project, and exams) is expected to be your own – See **Academic integrity policy statement** below.

- Please seek help before serious difficulties in your understanding of course material arise. In particular, it is much better to get your questions answered before an exam than after! There are multiple resources for help and tutoring. In addition to using my office hours, you may reach out to tutoring sessions provided by Eta Kappa Nu, Electrical and Computer Engineering Honor Society. In addition, you may utilize the resources of Center for Students Success: http://hawksites.newpaltz.edu/css/about-us/
- Please make sure you save your graded homework, test, and report. I may ask for them in case of any grading discrepancy.
- **Last Day to Withdraw without Grade Penalty** for spring semester is February 5, 2023

## 7. Noteworthy Dates

Check the campus Academic Calendar to learn about important dates like:

- Semester Add/Drop Period start and end
- Campus Withdrawal Period start and end
- Holiday Observances
- Deadlines for Graduation Applications, Leaves of Absence, Study Abroad, etc.
- Pre-registration period for next semester
- Registration Moratoriums
- SEI Availability start and end

## 8. Campus Policies

ACADEMIC INTEGRITY POLICY

Students are expected to maintain the highest standards of honesty in their college work. Cheating, forgery, and plagiarism are serious violations of academic integrity. Students found guilty of any violation of academic integrity are subject to disciplinary action, up to and including expulsion.

Ignorance of the academic integrity policies does not constitute a defense. It is the student's responsibility to understand and to adhere to this policy.

CAMPUS EMERGENCIES & DELAYS POLICY

Classes will be cancelled or delayed only under extreme circumstances, such as severely inclement weather or other emergency situations. Students, faculty and staff have the ability to have emergency notifications sent to their cell phone.

REASONABLE ACCOMOODATIONS

Students needing classroom and/or testing accommodations related to a disability should contact the Disability Resource Center as close as possible to the beginning of the semester. The DRC will then provide students' instructors with an Accommodation Memo verifying the need for accommodations.
Student Union Building
Room 210
845-257-3020
Specific questions about services and accommodations may be directed to
Deanna Knapp, Assistant Director
(knappd@newpaltz.edu
Jean Vizvary, Director

vizvaryj@newpaltz.edu

## ACADEMIC ASSISTANCE

The Center for Student Success (CSS) provides students with peer based academic skills coaching and advising, online tutoring, subject tutoring in historically difficult courses, and writing support across the curriculum. CSS services are intended to enhance, not supplant, other forms of collaborative learning. The Center also houses the campus-wide student success system, powered by Starfish. Please visit the csS website to learn more about the services available.

## VETERAN & MILITARY SERVICES

New Paltz's Office of Veteran & Military Services (OVMS) is committed to serving the needs of veterans, service members and their dependents during their transition from military life to student life. Student veterans, service members or their dependents who need assistance while attending SUNY New Paltz may refer to OVMS's website; call 845-257-3120, -3124 or -3074; e-mail np-vms@newpaltz.edu; or stop by the Student Union, Room 100 South.

**Military Obligations**

In partnership with academic and professional faculty, the Office of Veteran & Military Services (OVMS) makes every effort to provide reasonable accommodations for individuals who must be absent due to military obligations. The student and faculty member must agree that the length of the absence is reasonable for the type and structure of the course and must devise a written plan detailing expectations for successful course completion. Students who actively participate in the United States Military Reserve or National Guard are highly encouraged to provide each faculty member, as well as the OVMS, a copy of their Reserve and/or National Guard schedule during the first week of class each semester.

## RELIGIOUS OBSERVANCE

Students who will be taking time to observe religious holidays should communicate with faculty, coaches, etc. as soon as possible regarding absences for religious observations and be prepared to discuss plans for making up missed work. Faculty and staff will continue to respect the needs of our students and, in compliance with the New York State Education Law (Chapter 161, Section 224), honor students' requests for such rescheduling and collaborate with them to determine a path to make up missed work.

## TECHNICAL SUPPORT

For technical support, including account and system related issues, go to support.newpaltz.edu to visit our knowledge base or submit a support ticket 24 hours a day. Our Service Desk is available during business hours (see support.newpaltz.edu) for live support.

Email: servicedesk@newpaltz.edu
Call: 845-257-4357
Visit: Humanities, Room 103

COMPUTER & NETWORK USE POLICY

Users of New Paltz's computer resources and network facilities are required to comply with the institutional policies outlined in the Acceptable Uses and Privacy Policy and other technology policies, available at the link provided.

ONLINE IDENTITY VERIFICATION POLICY

New Paltz's Online Identity Verification Policy is designed to verify that students enrolled in our online courses and/or programs are the ones who take the courses, complete the programs, and receive the academic credit. The complete policy is published in the Undergraduate Catalog.

TITLE IX & RELATED POLICIES

Gender discrimination, sexual harassment, sexual assault, sexual violence, stalking, and power-imbalanced sexual/romantic relationships between faculty and students are strictly prohibited within the SUNY New Paltz community. We encourage students to report, confidentially discuss, or raise questions and concerns regarding potential violations. Reports can be made to the Title IX Office, the department chair and/or the dean of your school. For information on Title IX reporting and support, visit https://www.newpaltz.edu/titleix/. The College's Consensual Relationship Policy can be found at HR Policies.

**STUDENT EVALUATION OF INSTRUCTION**

You are responsible for completing the Student Evaluation of Instruction (SEI) for this course and for all your courses with an enrollment of five (5) or more students. I value your feedback and use it to improve my teaching and planning. Please complete the form during the open period on-line.

## 9. Building Community in a Virtual or Online Environment

Nearly all of us — students, instructors, and staff — are adjusting to a new environment of teaching and learning with more virtual or online interactions, whether in real time (via video or phone) or asynchronously. Not being together gives us additional responsibilities. Building community in a virtual teaching and learning environment can sometimes feel isolating and challenging.

Under the current conditions we will all be relying on written communication with classmates and instructors more than has been in the past. Written communication lacks the social queues and nuances upon which we have come to rely, like body language and tone of voice. This means we all have a greater responsibility to be mindful of the words and interpretations we choose.

To create as much of a sense of community as possible and to strengthen our communication during this unprecedented time, I invite you to:

### Consider

- Using intentional language to justify your thoughts. Draw on scholarly or research knowledge as appropriate, and recognize that there are many forms of knowledge.
- Making generous assumptions about where people are coming from, that is, consider exercising the presumption of goodwill.
- Communicating from your own perspective.
- Giving credit where credit is due by citing and linking to resources as appropriate.

- The readability of your written communication.
- That your readers will bring their own life experiences and knowledge to what you write and may often interpret your words as well as course ideas differently than you.

## Be mindful

- That none of us knows everything. It is acceptable to say that you do not know. If you are guessing, state that you do not know but provide your thinking and share your reasoning.
- Of respecting that other people have different life experiences and opinions.
- Of sharing another person's professional or personal information.
- That there are different forms of written and oral communication and multiple forms of English. These range from emoticons and JPEGs to translanguaging to formal, academic writing. If you are unsure what form your instructor is asking for, ask for clarification. Part of the work of being a college student is to learn to recognize different forms of language and the power attached to them.
- That people on the other side of the screen, phone, or written communication are whole human beings.
- Of your audience. Who will read what you have written?