Maintaining Public Health

To protect the health of everyone in this class, all students are required to wear a mask or other face covering while inside campus buildings. Your mask must adequately cover both your nose and mouth. This is in keeping with the College's fall 2021 policy of an on-campus, indoor mask requirement for everyone, including those who have been fully vaccinated. A student who comes to class without a mask will be required to obtain one before returning to class. A limited number of masks may be available at designated locations on campus. Any student who refuses to wear a mask or face covering may not enter the classroom nor participate in the class. There will be no exemptions or waivers of the 100% compliance mask policy. Continued refusal to wear a mask or face covering will be reported to the Student Conduct Office based on Student Conduct Code's "Non-Compliance with Official Requests" (which includes public health policy). Masks are for both your own and for others' safety and wellbeing – please remember our campus commitment to the "We Not Me" approach, and take this simple step to protect yourself and others.

Students with temporary illnesses must work with professors and make arrangements to make up coursework.

For more information about The Pledge and expectations, go to "**Protect New Paltz: A Pledge to Stop the Spread of COVID-19**."

EGC455 / EGE 593 -01 Design and Verification of System on Chip
(3 credits*)
Fall 2021 Semester

1. Course Information

Course Number: EGC455 / EGE593 -01
Course Title: Design and Verification of System on Chip
No. of Credits: 3
Time on Task: 135 hours
Course Designation: Undergraduate
Teaching Modalities: Seated Lecture
Meeting: MR 9:30 AM - 10:45 AM, Wooster 221
 Course Website: http://www.engr.newpaltz.edu/~bai/EGC220/EGC455_fall.html

Pre-requisites: Students must successfully earn a grade of "C-" or better in all the following (or equivalent) prior to taking this course
- EGC320 – Digital Systems Design
- EGC442 – Introduction to Computer Architecture
- EGC445 – VLSI Design

Catalog Description

System-on-chip (SoC) design and verification, IP (intellectual property) reuse in design and verification,hardware/software co-design, embedded software, functional verification using SystemVerilog andUniversal Verification Methodology (UVM).

Reading Materials

The UVM Primer, An Introduction to the Universal Verification Methodology, Ray Salemi, ISBN 9780974164939
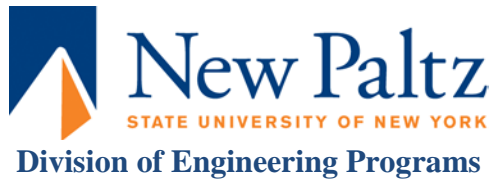
References:

- *FPGA Simulation, A Complete Step-by-Step Guide,* Ray Salemi
- *Comprehensive Functional Verification,* Bruce Wile, John Goss, Wolfgang Roesner, Morgan Kaufmann.

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
- Monday and Thursday   1:00 PM – 2:30 PM

- Wednesday   1:00 PM – 2:00 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

Randy Copeman
Adjunct Lecturer

203 Resnick Engineering Hall
copemanr@newpaltz.edu

(845) 257-3720 Engineering Secretary's Office

Office Hours
- By appointment (WH221 or REH203)

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 be introduced to the need and the process of functional verification along with implementing a functional computer system for a given set of requirements using the hard processing system and FPGA utilities of a modern SoC device.
 II. Work together in groups to complete Verification and SoC projects.

Contributions

SO	SLO	Level
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	I	High
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	II	Medium

4. Course Contents and Procedure

Verification Topics
1. Hardware Functional Verification
2. System Verilog
3. Object Oriented Programming
4. System Verilog Interface
5. Packages, Includes and Macros
6. UVM Components and Tests
7. UVM Environment
8. Connecting Objects
9. Transaction Level Testing

10. UVM Reporting
11. Functional Coverage with Covergroups
12. Introduction to Sequences

SoC Topics
1. Intro to System-on Chip
2. Review of Data Types/Sizes/Math/Logic
3. Intro to the DE10-Nano Development System
4. Intro to the FPGA
5. Hardware Review
   a. GPIO
   b. Pull-up/Pull-down resistors
   c. LED output drive
6. Intro to HPS
7. Intro to Direct Digital Synthesis
8. Combined HPS and FPGA
9. Final Project

5. Grading

Assessments and Weights

Verification Projects	40 %
SoC Question Sheets	10%
SoC Project Results	20%
SoC Final Project	30%
Total	**100 %**

Grading Schema

Total Points	Final Grade
91 - 100	A
88 – 90.9	A-
84 - 87.9	B+
81 – 83.9	B
78 – 80.9	B-
74 - 77.9	C+
71 – 73.9	C
68 – 70.9	C-
Below 68	F

6. Rules and General Comments:

- ♦ **Attendance**: We 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 fall semester is October 29

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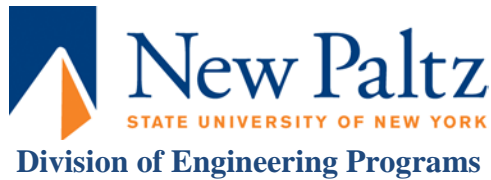
Email: servicedesk@newpaltz.edu
Call: 845-257-4357
Visit: Humanities, Room 103

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.