

# NC STATE UNIVERSITY

## ECE 310 – Design of Complex Digital Systems

Sections: 001, 602

Syllabus – Spring 2026

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### Instructor Information

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| Name                                   | Office Phone | Email                                                  | Office Location |
|----------------------------------------|--------------|--------------------------------------------------------|-----------------|
| Dr. Mihail Cutitaru<br>(Dr. C/Prof. C) | 919-513-0827 | <a href="mailto:mcutita@ncsu.edu">mcutita@ncsu.edu</a> | EB2 2076        |



### Office Hours

In-person (EB2 2076): MW 10AM-12PM

Hybrid: MW 1PM-2PM (in person in EB2 2076 and on Zoom at: <https://ncsu.zoom.us/my/mcutita> )

All other times by appointment, send an email with a few availability options for days/times.

### Preferred Method of Communication & Response Time

- **Preferred method of communication:** Course support email ( [ece-310-sprg-2026-support@wolfware.ncsu.edu](mailto:ece-310-sprg-2026-support@wolfware.ncsu.edu) ) is the preferred method of communication for any course-related questions as this email is monitored by myself and the TAs and you are likely to receive a reply faster. If you have any other specific questions that should not be shared with the teaching staff (e.g. illness, etc), please email me directly. For both email addresses, expect to receive a reply within one (1) business day. It is recommended that you check your NC State email at least once a day as I send out notices and reminders for assignments via email.

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- **Asking questions about the course:** A Discord server may be set up if the majority of the class deems it necessary.
- **Email guidelines:** Always include “ECE 310 - *YourTopic*” in your emails and provide a concise topic description. In the body of the email, provide a detailed description of the issue(s) you are facing, anything you have attempted to fix the issue, screenshots of errors, line numbers for any attached code, etc, to help us get a better understanding of the issue(s) and solve them via email. If the issue may be more difficult to solve, please provide a few options for days/times for a Zoom meeting to help resolve it faster. Please use proper greetings, spelling, signature, and email etiquette in your emails.

## Teaching Assistants (TAs)

Use the ECE 310 support email for any course-related questions:

[ece-310-sprg-2026-support@wolfware.ncsu.edu](mailto:ece-310-sprg-2026-support@wolfware.ncsu.edu)

| Name | Office Phone | Email | Office Location |
|------|--------------|-------|-----------------|
| TBD  |              |       |                 |

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## Course Information

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**Course Website:** Moodle ( <https://moodle-courses2527.wolfware.ncsu.edu/course/view.php?id=6671> )

**Meeting Time and Location (Lecture):** MW 8:30-9:45AM in EB3 2124 or remote

**Course Credit Hours:** 3

## Catalog Description

Design principles for complex digital systems. Decomposition of functional and interface specifications into block-diagrams and simulation with hardware description languages. Synthesis of gate-level descriptions from register-transfer level descriptions. Design and test of increasingly complex systems.

## Student Learning Outcomes

At the end of this course, you should be able to:

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- Describe combinational and sequential circuits using the Verilog language both structurally and behaviorally,
- Create testbenches and simulate your descriptions to verify their correctness,
- Determine the function of a description by simulating it,
- Use synthesis tools to generate hardware from your descriptions,
- Design a complex system consisting of data-path and control logic, managing the complexity with hierarchy, and
- Design systems with simple bus-protocols and interfaces.

## Structure

The majority of this course is **synchronous**, delivered through real-time, face-to-face class sessions. Additional materials and activities are delivered through Moodle and Gradescope. Daily written lecture slides will also be posted in a separate Google Drive folder. Daily lecture recordings are available in Panopto, a link to access them is posted in Moodle.

Learning activities in this course will include homeworks, labs, projects, and exams. In general, expect to have 2 assignment deadlines each week, with few exceptions: homework due on Wednesdays and labs due on Sundays. See Moodle for a list of due dates for all assignments.

## Homework

There will be approximately 9 homework assignments. Homework will be submitted and graded via Gradescope. All homework is to be done *individually*. Although you can discuss concepts with other students, the instructor, and the TAs, it is crucial that you know how to do every homework assignment on your own as similar material will be on the exams. Evidence of copying or other unauthorized collaboration will be investigated as a potential academic integrity violation. If you are tempted to copy because you're running late, you will be better off missing the assignment and taking a zero. The frequency and difficulty of homework assignments will decrease in the latter part of the course, as the programming projects begin.

Homework assignments are generally due by the end of day on Wednesdays (11:59PM Eastern) in Gradescope. You will need to generate an image or a .pdf of your written/typed work and select your submission for each question. Late homework submissions will not be accepted unless approved by the instructor at least 24 hours in advance.

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## Labs

This course has a lab component to allow you to master the topics covered in the lecture portion and deliver solutions to given design problems. There will be approximately 8 labs. Solutions of some labs may help in larger designs, such as Projects in this course. Each lab section has a dedicated meeting time in EB2 1014 (or RRO 203 at UNCA for remote students), check the lab schedule based on your lab section number. Lab attendance is optional, but it will allow you to ask the TA questions about the lab as well as work on the lab report. A lab report is required for all labs and is part of the lab grade. A sample lab template is available in Moodle.

Lab code and reports will be submitted and graded via Moodle and Gradescope. Labs are due by the end of day on Sundays (11:59PM Eastern). You will need to generate an image or a .pdf of lab report work and select your submission for each part. Late lab submissions will not be accepted unless approved by the instructor at least 24 hours in advance.

## Projects

There will be three (3) projects during the semester. The purpose of the projects is to extend the work done in labs and model larger circuits at the 3 levels of abstraction: structural/gate-level, dataflow, and behavioral. You will have 3-4 weeks to work on each project. All projects will have 2 deadlines: a design deadline (1-2 weeks) and a full submission deadline (2 weeks after design). Each project will require a report to accompany your code, similar to labs, but containing more in-depth explanations about design approach, code structure, theory, and discussion of results.

The tentative due dates of the Projects are as follows:

|                                          |                                  |
|------------------------------------------|----------------------------------|
| <b>Project 1:</b> Design Due: February 2 | Full Submission Due: February 16 |
| <b>Project 2:</b> Design Due: March 2    | Full Submission Due: March 25    |
| <b>Project 3:</b> Design Due: April 8    | Full Submission Due: April 22    |

## Exams

There will be one (1) midterm exam (15%) and one (1) comprehensive final exam (15%). All exams will be closed book and closed notes, no calculators of any kind. The midterm exam will be

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administered during normal class periods/lecture time, in the regular classroom, on or close to the date listed below. The final exam will be given according to the university schedule.

- Midterm Exam: Wednesday March 11 (tentative)
- **Final Exam: Monday May 4, 8:30-11:00AM, EB3 2124**

Attendance at all exams is mandatory. Missed exams will **NOT** be made up without a documented excused absence. The instructor must be contacted by email as soon as possible to qualify for a make-up exam. Do not ask for permission to take any exam early or late because of individual family travel plans or other reasons. These requests will not be granted.

Evidence of cheating on any exam will be investigated. If there is sufficient cause, the incident will be referred to the Office of Student Conduct as an Academic Integrity violation. **The minimum penalty for cheating on an exam is a grade of zero (0) on the exam.** See the NCSU Code of Student Conduct for information about what constitutes cheating. Continuing to work on an exam after the instructor calls an end to exam and asks for your papers, will result in a "0" on the exam and will be considered an academic integrity violation.

## Prerequisites

C- or better in ECE 212

## Minimum Technical and Digital Information Literacy Skills

Required technical skills

- Navigate and use Moodle and Gradescope
- Use Gmail, including attaching files to email messages
- Create and submit files in commonly used word processing program formats (MS Word, PDF, text editors, Google Docs)
- Download and install software as needed (see [section on required software](#))
- Download and upload attachments
- Use web conferencing tools including Zoom and Google Meet
- Post to discussion boards and forums

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Required digital information literacy skills

- Use computer networks to locate and store files or data.
- Properly cite information sources

## General Education Program (GEP) Information

GEP Category Fulfilled

None

GEP Corequisites

None

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## Course Materials

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### Optional Textbook

*Advanced Digital Design with the Verilog HDL*, 2nd ed. by M.D. Ciletti

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## Technology Requirements

NC State University Libraries offers [Technology Lending](#), where many devices are available to borrow for a 7-day period. [Computer labs](#) are available in various locations around campus for student use.

### Computer

A laptop computer/tablet is required for students taking this course. NC State's Office of Information Technology provides recommendations for [your computer at NC State](#).

### Other devices

None

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## Software and digitally-hosted course components

The following software and tools will be used in this course. Some tools are a part of NC State's enterprise tools. See [information about their purpose, how to access them, accessibility information, and privacy policies](#).

The same information for any other tools required in this course is provided in the list below.

- Xilinx Vivado (install on own laptop or access in lab rooms or remotely)
- LaTeX (optional)

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## Other Student Expenses

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None

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## Communication Guidelines

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### Respecting our learning community

The [NC State Code of Student Conduct](#) outlines expectations for behavior in the classroom (whether virtual or physical) and the consequences for students who violate these expectations. Any behavior that impacts other students' ability to learn and succeed will be addressed, but expressing diverse viewpoints and interpretations of course content is welcome.

Community guidelines for this course include:

- Use a respectful tone in all forms of communication (email, written, oral, visual)
- Maintain professionalism (avoid slang, poor grammar, etc.) in your written communication.
- Respect regional dialects and culturally embedded ways of oral communication.
- Stay home or in your dorm room if you are exhibiting symptoms of a contagious illness (fever, chills, etc.).
- Enter our virtual and/or physical classroom community respectfully by refraining from lewd or indecent speech or behavior, helping to maintain a safe physical environment, not using your cell phone for voice or text communication except when explicitly given leave to do so, and not attending class under the influence of any substance.

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- Treat each community member with respect by not recording others without their consent or engaging in any form of hazing, harassment, intimidation, or abuse.
- Respect cultural differences that may influence communication styles and needs.

## Plan for interaction between instructors and students

Weekly announcements with list of deliverables and due dates will usually be sent out on Sunday afternoons. Additional reminders may be sent for heavier-weighted assignments periodically. Any clarifications for assignments, exam logistics and topics, changes in due dates, etc, will be communicated via the class email to all students. **Please check your NC State email often.**

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## Grading and Feedback

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### Grading criteria, details, and timing of feedback

For PS assignments, programs, and exams, I expect the work to be graded usually within 1 week. Once grades are posted, you will have an additional 1 week to request a regrade. The regrade process will involve you submitting a regrade request and documenting why a regrade is needed. Once the regrade window has closed and the regrade request has been handled, no additional changes will be made to any grades in these 3 categories.

| Item         | Weight | Comments                 |
|--------------|--------|--------------------------|
| Homework     | 16%    | Drop 1 Lowest Grade      |
| Labs         | 16%    |                          |
| Projects     | 38%    | P1: 8%, P2: 14%, P3: 16% |
| Midterm Exam | 15%    |                          |
| Final Exam   | 15%    | Comprehensive            |

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## Grading scale

This course uses the standard NC State grading scale.

| Numerical Score                 | Letter Grade |
|---------------------------------|--------------|
| $97 \leq \text{score} \leq 100$ | A+           |
| $93 \leq \text{score} < 97$     | A            |
| $90 \leq \text{score} < 93$     | A-           |
| $87 \leq \text{score} < 90$     | B+           |
| $83 \leq \text{score} < 87$     | B            |
| $80 \leq \text{score} < 83$     | B-           |
| $77 \leq \text{score} < 80$     | C+           |
| $73 \leq \text{score} < 77$     | C            |
| $70 \leq \text{score} < 73$     | C-           |
| $67 \leq \text{score} < 70$     | D+           |
| $63 \leq \text{score} < 67$     | D            |
| $60 \leq \text{score} < 63$     | D-           |
| $0 \leq \text{score} < 60$      | F            |

## Requirements for earning a grade of “Satisfactory”

If you are taking this course for credit only (S/U), your grade will be reported as S (Satisfactory) when your work is equivalent to a C- or better or U (Unsatisfactory) when coursework is equivalent to less than a C-. For more information, see the [Credit Only Courses regulation](#).

## Requirements and procedures for auditing this course

Auditing this course is approved on a case-by-case basis. Please contact the course instructor to attain approval. Refer to the [Audit regulation](#) for more information and links to required forms.

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## Course Schedule

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Please note that the course schedule is subject to change. Number of lectures is approximate and material coverage may change as needed.

| Topic                                | # Lectures |
|--------------------------------------|------------|
| Introduction/Review                  | 2          |
| Verilog Introduction                 | 2          |
| Gate-level/Structural Modeling       | 2          |
| Dataflow Modeling                    | 2          |
| Behavioral Modeling                  | 4          |
| Memory, FSM Design                   | 2          |
| Synthesis                            | 2          |
| Clocks, Delay Models, Random Numbers | 3          |
| CPU Design, Delay                    | 2          |
| Functions, Tasks, Pipelining         | 2          |
| Performance Optimization             | 2          |

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## Course Policies

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### Proctored exams

None (DRO students must schedule their exams with DELTA)

### Late assignments

Late assignments are not accepted unless any extensions have been granted.

### Incomplete grades and withdrawals

Information on incomplete grades can be found at [REG 02.50.03 – Grades and Grade Point Average](#). If you encounter a serious disruption to your work not caused by you and you would have otherwise successfully completed the course, contact your instructor as soon as you can to discuss the possibility of earning an incomplete in the course for the semester, including an agreement on when the remaining work must be done in order to change the grade to the appropriate letter grade.

If you must withdraw from a course or from the University due to hardship beyond your control, see [Withdrawal Process and Timeline | Student Services Center](#) for information and instructions.

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## Attendance

- Lecture attendance is not required (optional)
- Exam attendance is required
- If you must miss a class, you are responsible for catching up on any content covered during that lecture. Exams will not be made up unless the instructor is contacted at least 24 hours in advance of an assignment date or as soon as possible after an emergency.

Related NC State Policy: [REG 02.20.03 – Attendance Regulations](#)

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## University Policies

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### Academic integrity and honesty

Students are required to comply with the university policy on academic integrity found in the [Code of Student Conduct 11.35.01 sections 8 and 9](#). Therefore, students are required to uphold the Pack Pledge: “I have neither given nor received unauthorized aid on this test or assignment.” Violations of academic integrity will be handled in accordance with the [Student Discipline Procedures](#).

Please refer to the [Academic Integrity](#) web page for a detailed explanation of the University’s policies on academic integrity and some of the common understandings related to those policies.

### Student privacy

#### Originality Checking Software

Software is being used in this course to detect the originality of student submissions for coding projects/programs.

#### Class recording statement:

In-class sessions are recorded in such a way that might also record students in this course. These recordings will NOT be used beyond the current semester or in any other setting outside of the course.

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## Class privacy statement:

This course requires online exchanges among students and the instructor, but NOT with persons outside the course. Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web postings, where relevant to the course. Examples include online discussions of class topics and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

## Other Policies

Students are responsible for reviewing the NC State University PRR's which pertain to their course rights and responsibilities:

- [Equal Opportunity and Non-Discrimination Policy Statement](#) and [additional references](#)
- [Code of Student Conduct](#)
- [Grades and Grade Point Average](#)
- [Credit-Only Courses](#)
- [Audits](#)

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## Student Resources

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Academic and Student Affairs maintains a website with links for student support on campus, including academic support, community support, health and wellness, financial hardship or insecurity, and more. [Find Help on Campus.](#)

## Disability resources

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the [Disability Resource Office \(DRO\)](#). For more information on NC State's policy on working with students with disabilities, please see the [Policies, Rules and](#)

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[Regulations page maintained by the DRO](#) and [REG 02.20.01 Academic Accommodations for Students with Disabilities](#).

## Safe at NC State

At NC State, we take the health and safety of students, faculty and staff seriously. [The Office of Equal Opportunity](#) supports the university community by providing services and resources to support and guide individuals in obtaining the help they need. See the [Safe at NC State webpage](#) for resources.

## Supporting Fellow Students in Distress

As members of the NC State Wolfpack community, we each share a personal responsibility to express concern for one another and to ensure that this classroom and the campus as a whole remain a healthy and safe environment for learning. Occasionally, you may come across a fellow classmate whose personal behavior concerns or worries you, either for the classmate's well-being or yours. If you feel this way, I would encourage you to report this behavior to the [NC State CARES website](#). Although you can report anonymously, it is preferred that you share your contact information so they can follow up with you personally.

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## Course Evaluations

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ClassEval is the end-of-semester survey for students to evaluate the instruction of all university classes. The current survey is administered online and includes 12 closed-ended questions and 3 open-ended questions. Deans, department heads, and instructors may add a limited number of their own questions to these 15 common-core questions.

Each semester students' responses are compiled into a ClassEval report for every instructor and class. Instructors use the evaluations to improve instruction and include them in their promotion and tenure dossiers, while department heads use them in annual reviews. The reports are included in instructors' personnel files and are considered confidential.

Online class evaluations will be available for students to complete during the last two weeks of the semester for full-semester courses and the last week of shorter sessions. Students will receive an email directing them to a website to complete class evaluations. These become unavailable at 8 am on the first day of finals.

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- Contact ClassEval Help Desk: [classeval@ncsu.edu](mailto:classeval@ncsu.edu)
- [ClassEval website](#)
- [More information about ClassEval](#)

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## Syllabus Modification Statement

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Our syllabus represents a flexible agreement. It outlines the topics we will cover and the order in which we will cover them. Dates for assignments represent the earliest possible time they would be due. The pace of the class depends on student mastery and interests. Thus, minor changes in the syllabus can occur if we need to slow down or speed up the pace of instruction. Any changes will be communicated during lecture and via email shortly after they are made.

This syllabus was last modified on: *8 January 2026*.