UAB COLLEGE OF ARTS AND SCIENCES
The University of Alabama at Birmingham

Department of Computer Science

Fall 2024
CS 660 / CS 760:   Artificial Intelligence
Class time: 5.00-7.30pm, Thursdays

Instructor: Dr. Hy Truong Son, <thy@uab.edu>

Research students from HySonLab who contribute on the course materials:
- Quy-Anh Dang
- Hiep Dang
- Anh Dao
- Le Minh Tuan
- Tuan Le
- Ngoc Son Nguyen
- Khoi Nguyen
- Vu Duy Tung
- Hana Dinh

Teaching Assistant: Srushti Rajendrakumar Nayak, <snayak@uab.edu>

Teaching time zone: US Central Time

This handout contains information on syllabus together with policies and expectations I have established for the course. Please read the entire document carefully before continuing in this course. The policies and expectations are intended to create a productive learning atmosphere for all students. To participate in the course, students are prepared to abide by these policies and expectations.

Office Hours

Instructor: 3-5pm, Mondays
Available to meet with students virtually on Zoom or in-person during my office hours **by appointment only**. Instructor's Zoom meeting room:
Truong Son Hy is inviting you to a scheduled Zoom meeting.

Topic: CS 660 / CS 760 - Office Hours
Time: Aug 26, 2024 03:00 PM Central Time (US and Canada)
        Every week on Mon, 17 occurrence(s)
Please download and import the following iCalendar (.ics) files to your calendar system.
Weekly: https://uab.zoom.us/meeting/tZYldu-srTIjHtHHTUzOpSdL2gf3fds1wlUR/ics?icsToken=98tyKuGqpjosHtecuR2CRpwQGoj4M-jztlhEgrd1tCvQGQ9DUQfaZOVEYbR7A4nH&meetingMasterEventId=mLB59bxxRACuPcnGYvWLxw

Join Zoom Meeting
https://uab.zoom.us/j/82816439945?pwd=RZ02kkzVVnt8u6vKFDQzvcfI4cC0iW.1

Meeting ID: 828 1643 9945
Passcode: 205908

Teaching Assistant: Office hours of the TA will be every Friday morning at 9:00 to 11:00 AM.
Topic: TA HOURS -CS 660 / 760 - AI Srushti Nayak
Time: 09:00 AM Central Time (US and Canada)
    Every week on Fri, until Dec 13, 2024, 16 occurrences
Join Zoom Meeting
https://us04web.zoom.us/j/74568887914?pwd=t8jupev6KolAN3GPFVj3TNepSZd22e.1
Meeting ID: 745 6888 7914
Passcode: srVshh

Preferred Methods of Communication
If you have questions, please use "Inbox on Canvas" to email the instructor and the TA. This will ensure all correspondences related to this course are organized in one place on Canvas. Please do NOT use other means to send emails to the instructor or the TA. In particular, please do not use Outlook or other email software to send messages to the instructor's or TA's UAB email address directly.
Please expect a response within 24 hours on weekdays and a slower response on weekends (emails in Inbox on Canvas received after 5 pm on Friday will be replied Monday morning). For a faster response, include in the subject line of your Inbox email a couple of keys describing your questions.

Instructional Method
This class will be conducted **in-person** in the designated classroom at the designated times.
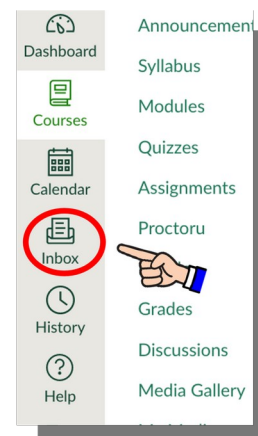
Important Note
From Fall 2024, there will **no** recording service. That means you **have to attend the lectures in-person**.

Course Description
This course aims to equip students with fundamental knowledge and programming skills in artificial intelligence, with an emphasis on modern approaches represented by Generative Artificial Intelligence (Generative AI). Topics covered include types of AI, an overview of traditional techniques and approaches to AI including searching algorithms, evolutionary algorithms (EA), and ant colony optimization (ACO), Large Language Models (LLM), Large Vision Models (LVM), and generative models such as diffusion and flows, code generation by LLM, graph neural networks, and applications of AI in practices.

Student Learning Outcomes
Upon successful completion of this course, you are expected to be able to:

1. Understand key concepts of traditional approaches of AI including searching algorithms, EA, and ACO.
2. Understand key algorithms and building blocks of LLM, LVM and well-known generative models.
3. Utilize APIs for Generative AI to build real-world applications.
4. Use Deep Learning frameworks (e.g., PyTorch, PyTorch geometric) to further develop and implement Generative AI.

Prerequisites
Basic programming skills in Python are required.

Required Textbooks
1. **Speech and Language Processing**, Dan Jurafsky, James H. Martin
   https://web.stanford.edu/~jurafsky/slp3/
2. **Deep Learning**, Ian Goodfellow and Yoshua Bengio and Aaron Courville
   https://www.deeplearningbook.org/
3. **Artificial Intelligence: A Modern Approach**, Stuart J. Russell and Peter Norvig
   https://people.engr.tamu.edu/guni/csce421/files/AI_Russell_Norvig.pdf

Recommended Readings
- **Machine learning: A probabilistic perspective**, Kevin Murphy
  https://probml.github.io/pml-book/
- **Pattern Recognition and Machine Learning**, Christopher M. Bishop
  https://www.microsoft.com/en-us/research/uploads/prod/2006/01/Bishop-Pattern-Recognition-and-Machine-Learning-2006.pdf
- **The Elements of Statistical Learning**, Trevor Hastie, Robert Tibshirani and Jerome H. Friedman
  https://www.sas.upenn.edu/~fdiebold/NoHesitations/BookAdvanced.pdf
- **Graph Representation Learning**, William L. Hamilton
  https://www.cs.mcgill.ca/~wlh/grl_book/files/GRL_Book.pdf
- Additional references may be provided at the end of lecture notes/slides.

Important Dates
Last Day to Drop/Add w/o penalty: 9/3/2024
Fall/Thanksgiving break: 11/25-29/2024
Final exam: Thursday, December 12, 7:00pm – 9:30pm in the class room.
[Official exam schedule: https://www.uab.edu/students/academics/final-exams]

Grading Policy
Grades for this class are made of the following components:

Assignments & Projects: 60%
Final exam: 40%
TOTAL: 100%

For PhD students, you will have an additional final project that combines AI with your research interest. PhD students will have the opportunity to present their project in front of the class. If you are a PhD student, please see me ASAP to select the topic for your additional final project!

In general, final grades are determined based on the following policy:

Points (0-100)		0-59	60-69	70-79	80-89	≥90
Letter	CS 100-499	F	D	C	B	A
Grade	CS 500-599, 600-699, 700-799	F	C		B	A

Requirement to Pass Each Component of the Course

You must pass each component of the course to pass the course. The components are as follows: exams, homework, class attendance, and lab attendance if the course has lab classes. For each component, a passing grade is 60%.

The total points/grade on Canvas

Total or final grades you might see on Canvas may be incorrect, as it by default assumes that each component has an equal weight, which is inconsistent with the grading policy for this course. In addition Canvas does not take into account other factors such as penalties for AIC violations, rescaling, classroom decorum and excessive absences etc.

Policies and Expectations

Exam
There will be one final exam in this course. The exam will be administered during class. You will **not** be allowed to use your notes or book during the exam.

Late Submission Penalties
Projects/reports/assignments/homework submitted after the deadline will **not** be graded and the students will receive a 0 mark.

Makeup Policy
The final exam cannot be made up, nor can it be offered to students early.

Differentiation of Requirements and Expectations
Students in a higher-level section are expected to perform at a higher level than those in a lower-level section, by completing more challenging assignments, homework, quizzes, projects, examination questions and other tasks related to the study of the course. PhD students will have an additional final project that combines AI with your research interest.

Academic Integrity Code
The University of Alabama at Birmingham expects all members of its academic community to function according to the highest ethical and professional standards. Students, faculty, and the administration of the institution must be involved to ensure this quality of academic conduct. Please review UAB's Academic Integrity Code located at
https://www.uab.edu/one-stop/policies/academic-integrity-code
Violations of this integrity and honor code will result in a variety of sanctions as provided in the Code. A minor offense may result in a reduced grade for the associated assignment or homework. A major offense may, at a minimum, result in the failure of the course. Repeat offenders may be expelled from UAB.

The CS Department enforces a three-strike policy for violations of the UAB Academic Integrity Code by students. The three-strike policy defines the following minimum penalties:

1. First violation: 0 grade for relevant work (assignment, homework, exam, or project).

2. Second violation: F grade for course.

3. Third violation: F grade for course AND academic probation, suspension, or expulsion.

Add/Drop and Course Withdrawal

Drop/Add:
Deadlines for adding, dropping, or withdrawing from a course and for paying tuition are published in the Academic Calendar (https://www.uab.edu/students/academics/academic-calendar) available online.

Review the Full Term Withdrawal and Refund Policy for information on refunds for dropped courses: https://secure2.compliancebridge.com/uab/portal/getdoc.php?file=338

Withdrawal:
To avoid academic penalty, a student must withdraw from a course by the withdrawal deadline shown in the academic calendar and receive a grade of W (withdrawn). Failure to attend class does not constitute a formal drop or withdrawal.

Absenteeism or Tardiness

Students are expected to attend every scheduled class and remain in class for the duration of the session. Failure to attend class, arriving late or leaving early may impact your ability to achieve course objectives which could affect your course grade. An absence, excused or unexcused, does not relieve a student of any course requirement. Regular class attendance is a student's obligation, as is a responsibility for all the work of class meetings, including tests and written tasks. Any unexcused absence or excessive tardiness may result in a loss of participation points.

Three or more unexcused absences or instances of arriving late / leaving early (20 minutes or more), may result in the failure of the course.

Please arrive on time. The first 5 minutes of class are often the most important 5 minutes, as the lecture material is introduced, and important administrative issues are discussed.

Classroom Decorum
A quiet environment is mandatory for effective learning. Obviously, students must be able to hear the professor lecture. Therefore, conversations are not allowed in lecture.

- If you are disruptive in lecture or lab, you will be given one warning.
- After the first warning, further disruption will result a second warning together with in a 10% reduction of your final grade.
- Further disruption will receive a third warning with harsher punishment and likely failure of the course.

Conversations during exam will always result in failure of the exam, and you will be asked to leave.

You are encouraged to ask questions, but please hold up your hand and wait to be acknowledged by the professor.

Orderly, Productive Conduct and Course Netiquette

I will conduct this class in an atmosphere of mutual respect. I encourage your active participation in class discussions. Each of us may have strongly differing opinions on the various topics of class discussions. The conflict of ideas is encouraged and welcome. The orderly questioning of the ideas of others, including mine, is similarly welcome. However, I will exercise my responsibility to manage the discussions so that ideas and argument can proceed in an orderly fashion. You should expect that if your conduct during class discussions seriously disrupts the atmosphere of mutual respect I expect in this class, you will not be permitted to participate further.

The following are additional course expectations concerning etiquette on how we should treat each other online. It is very important that we consider these values during online discussions and email.

- Respect: Each student's opinion is valued as an opinion. When responding to a person during the online discussions, be sure to state an opposing opinion in a diplomatic way. Do not insult the person or their idea. Do not use negative or inappropriate language.
- Confidentiality: When discussing topics be sure to be discreet on how you discuss children, teachers, and colleagues. Do not use names of people or names of facilities.
- Format: When posting use proper grammar, spelling, and complete sentences. Avoid using ALL CAPITALS. This signifies that you are yelling. Avoid using shortcuts/text abbreviations such as 'cu l8r' for 'See you later.'
- Relevance: Think before you type. Keep posts relevant to the discussion board topic.

Working in Groups

Please make sure to check the group project instructions page in the Course Information module to locate your group and your group space in Canvas. In this group project activity, you will collaborate with other students to submit a report/video/ presentation. As a team, you will work together to break the project up into separate tasks and decide on the tasks or sub-tasks each member is responsible for. Be sure to leave enough time to put all the pieces together before the group assignment is due and to make sure nothing has been forgotten. See also a separate document on "Grading Policy for Group Assignments".

Time Commitment

This class meets once a week for 2.5 hours. In addition to our class time, you should spend about **8 hours per week** reading, studying, preparing for class discussions, and completing assessments.

Instructor's Absence or Tardiness

If I am late in arriving to class, please wait a full 20 minutes after the start of class before you may leave without being counted absent, or follow any instructions I may give you about my anticipated tardiness.

Communication Devices

The use of cell phones, beepers, or other communication devices is disruptive, and is therefore prohibited during class. Please switch off these devices or set them in vibration mode during class. Except in emergencies, those using such devices must leave the classroom for the remainder of the class period.

Inclement Weather

Classes will be canceled for weather only if the University cancels classes. Otherwise, you are expected to be present in class. **UAB Emergency Management** will be the official source of UAB information during any actual emergency or severe weather situation. The UAB Emergency Management Team will use B-ALERT, the university's emergency notification system, to communicate through voice calls, SMS text messages and emails to the entire campus all at the same time.

Peers' Contact Information

I encourage students to reach out and obtain contact information of up to three classmates. This will be helpful in the event of an absence, forming study groups, or communicating schedule changes, etc.

Contact 1	Contact 2	Contact 3
Name: Email: Phone Number:	Name: Email: Phone Number:	Name: Email: Phone Number:

Other Policies, Expectations and Resources

Divisive Concepts

All University faculty, instructors, and teaching staff have the academic freedom to explore, discuss, and provide instruction on a wide range of topics in an academic setting. This class may present difficult, objectionable, or controversial topics for consideration but will do so through an objective, scholarly lens designed to encourage critical thinking. Though students may be asked to share their personal views in the academic setting, no student will ever be required to assent or agree with any concept considered "divisive" under Alabama law, nor penalized for refusing to support or endorse such a concept. All students are strongly encouraged to think independently and analytically about all material presented in class and may express their views in a time, place, and manner consistent with class organization and structure, and in accordance with the University's commitment to free and open thought, inquiry, and expressions.

Shared Values Statement

Collaboration, integrity, respect, and excellence are core values of our institution and affirm what it means to be a UAB community member. A key foundation of UAB is diversity. At UAB, everybody counts every day. UAB is committed to fostering a respectful, accessible, and open campus environment. We value every member of our campus and the richly different perspectives, characteristics, and life experiences that contribute to UAB's unique environment. UAB values and cultivates access, engagement, and opportunity in our research, learning, clinical, and work environments. Our [School] aims to create an open and welcoming environment and to support the success of all UAB community members.

DSS Accessibility Statement

Accessible Learning: UAB is committed to providing an accessible learning experience for all students. If you are a student with a disability that qualifies under the Americans with Disabilities Act (ADA) and/or Section 504 of the Rehabilitation Act, and you require accommodations, please contact Disability Support Services for information on accommodations, registration, and procedures. Requests for reasonable accommodations involve an interactive process and consist of a collaborative effort among the student, DSS, faculty and staff. If you are registered with Disability Support Services, please contact me to discuss accommodations that may be necessary in this course. If you have a disability but have not contacted Disability Support Services, please call (205) **934-4205** or visit **the DSS website**.

Title IX Statement

In accordance with Title IX, the University of Alabama at Birmingham does not discriminate on the basis of gender in any of its programs or services. The University is committed to providing an environment free from discrimination based on gender and expects individuals who live, work, teach, and study within this community to contribute positively to the environment and to refrain from behaviors that threaten the freedom or respect that every member of our community deserves. For more information about Title IX, policy, reporting, protections, resources, and supports, please visit the **UAB Title IX webpage**.

Violence Prevention and Response Policy

The University of Alabama at Birmingham (UAB) is committed to maintaining a safe and secure educational environment and workplace, one which seeks to ensure the well-being and safety of faculty and staff, employees, students and visitors. Violence and threatened violence are prohibited by UAB. Each member of the UAB community has the responsibility to understand, prevent, and respond appropriately to campus/workplace violence. For more information, view the **Violence Prevention and Response Policy**.

Technology

Access technical support and view privacy policies and accessibility statements for Canvas and other technologies on the **Student Learning Technologies website**. Additionally, view information about the **Minimum System Requirements and Technical Skills**.

Canvas Alerts

I may send alerts to students based on Canvas course information, such as current grades in the course, online attendance (login records), assignment due dates, and assignment scores. The alert is sent as an email to the student's UAB email address.

Health and Safety

UAB is very concerned for your continued health and safety. Please consult the **Student Health Services webpage** for up-to-date guidance because the following information is subject to change as circumstances require.

We strongly urge you to be fully vaccinated. Mask-wearing has proven to be one of the most successful mitigation strategies used to combat spread of the various variants of the COVID-19 virus. View information on the Immunization Requirements and Policies of the University on the **Student Health Services Immunizations webpage.**

Student Academic and Support Services

- **One Stop Student Services** provides a single point of professional integrated service to students. The One Stop serves students who need assistance with academic records, financial aid, registration, student accounting, ONE card, and other related topics.

- **Student Assistance and Support** provides individualized assistance to promote student safety and well-being, collaboration and resilience, personal accountability, and self-advocacy. The Care Team consults and collaborates with campus partners to balance the needs of individual students with those of the overall campus community. **The UAB Care Team** helps find solutions for students experiencing academic, social, and crisis situations including mental health concerns.

- **Disability Support Services** assists students with reaching accommodations for their educational experiences at UAB that ensure that they have equal access to programs, services, and activities at UAB.

- The **Vulcan Materials Academic Success Center** provides tutoring, supplemental instruction, and other services that encourage goal achievement and degree completion.

- The **University Writing Center** offers free writing assistance for all UAB students. Get help at any stage of the writing process and with any type of writing. Students may meet with a tutor in person or via Zoom. Students may also upload a paper for feedback (called eTutoring in the online system). During in-person and Zoom sessions, tutors can help you understand your assignment, develop and organize your ideas, use and cite sources, revise and edit your draft, and more. When you upload a draft for eTutoring, tutors can provide feedback on both big-picture issues and detail-oriented concerns; please note that you must upload a draft and assignment sheet to use eTutoring.

  To make an appointment or get more information, please see the **UWC website**, email

writingcenter@uab.edu, or call 205-996-7178. Follow the UWC on **Facebook**, **Instagram**, and **LinkedIn** for daily news and quick writing tips.

- **UAB Student Health Services** delivers comprehensive, high quality, confidential, primary healthcare to students. Student Health provides testing services and vaccination clinics.

- **Student Counseling Services** offers students a safe place to discuss and resolve issues that interfere with personal and academic goals. UAB has created a new app (available in the App Store and Google Play) called **B Well**, that is designed to easily access resources on mobile devices and build a self-care plan. **Kognito** is a free, interactive simulation-based platform designed to help you talk with someone when you are worried about your mental health.

- **UAB Blazer Kitchen at the Hill Student Center** provides food and basic supplies for any UAB student in need through in-person or online shopping. Students who can are also able to donate food and supplies to assist their peers. To get more information, call 205-975-9509, email **studentoutreach@uab.edu**, or visit the **Student Assistance & Support website**.

- The **Office of Learning Technologies** provides numerous academic technologies and learning resources for students.

- **UAB Emergency Management** will be the official source of UAB information during any actual emergency or severe weather situation.

The following are the various websites describing additional student academic and technology resources:

- **UAB Policies for Students**

- **Student Academic and Support Services**

- **Technology Resources**

See also the **Student Assistance & Support** website of Student Affairs for a description of Covid-19-related resources, including the laptop loaner program.

Intellectual Property

My lectures and course materials, including PowerPoint presentations, quizzes, exams, outlines, and similar materials, are protected by copyright. You may take notes and make copies of course materials for your own use. You may not and may not allow others to reproduce or distribute lecture notes and course materials publicly, whether or not a fee is charged, without my expressed written consent.

UAB COLLEGE OF ARTS AND SCIENCES
The University of Alabama at Birmingham

Department of Computer Science

Guide for Students on Use of AI tools in Computer Science Courses

Use of AI tools in a course

A course may allow the use of artificial intelligence (AI) tools in all assignments, or ban the use in some or all assignments so that you can develop the skills necessary to pass future exams that will not allow AI tools. Individual assignments will indicate whether or not AI tools are allowed.

Regardless of whether AI tools are allowed, it is important for students to be able to demonstrate both "proof of work" and "proof of understanding or ability" for all submitted work.

Rules for use of AI tools in an assignment

When AI tools are allowed (or required) in an assignment, you must provide "proof of work (trails)" including:
- **the prompt** that you used to generate the code
- **the original code** resulting from this prompt
- and a formal **citation where appropriate**

In addition, students must be able to provide "proof of understanding or ability", that is you **understand** any AI-generated code that you use (if you don't understand it, remove it), and can explain how the code works.

AI-generated code is often wrong, and rarely, if ever, perfect, or even adequate, without alteration. Even if it compiles, it may implement the specification using the wrong strategy or it may solve a different problem. Therefore, with AI-generated code, you must:

- **adapt/improve** the code to better solve the prescribed task
- be able to **discuss improvements you made** to the original code, and why
- **debug** the code
- **test** the code, preferably with unit tests and a testing framework
- **document** the code (which can also reveal issues)

Note that software development involves much more than pure code. AI coding can help you focus on other issues such as the **design** of the algorithm, on the development of **test** data and unit tests, on **profiling** the code to discover efficiency bottlenecks, on **documentation** of the code, and so on.

Perhaps most importantly, you should be able to explain any work that you submit, including the design, code, testing and debugging process and documentation etc generated by AI, when asked by a TA or professor. You should take notes, or document the code, algorithm or design to remember, and refresh your memory regularly.

Version history:
Ver. 1, Aug. 18, 2023

UAB COLLEGE OF ARTS AND SCIENCES
The University of Alabama at Birmingham

Department of Computer Science

Penalties for Violating the UAB Academic Integrity Code

The following policies are enforced in alignment with the UAB Academic Integrity Code:
https://www.uab.edu/one-stop/policies/academic-integrity-code

UAB requires that both faculty and students uphold high standards of academic honesty and integrity. Everyone who witnesses academic misconduct has a duty to report it.

Violations of the Academic Integrity Code transfer across courses. Records of past violations are maintained by the university's student conduct system and by the Dean's office.

1. Course work

The Department enforces a three-strike policy for violations of the UAB Academic Integrity Code by undergraduate and graduate students in their course work:

1) First violation:
   If it is the first violation by the student in any UAB course, the **minimum penalty** the student receives is a 0 grade for the particular assignment, homework, exam, or project.
2) Second violation:
   If it is the second violation by the student in any UAB course, the **minimum penalty** the student receives is an F grade for the course in which the second violation occurred.
3) Third violation:
   If it is the third violation by the student in any UAB course, the department will recommend academic probation, suspension or expulsion of the student from the major and from UAB, in addition to an F grade for the course.

2. Research

The Department enforces a one-strike policy for violations of the UAB Academic Integrity Code by students on scholarly research which includes preparing manuscripts, performing research, taking comprehensive examinations, and any other activity related to research and completion of degree requirements.

1) First violation on research: expulsion of the student from the graduate program and from UAB

Version history: 2016, 2019, 2023, 2024

UAB COLLEGE OF
ARTS AND SCIENCES
The University of Alabama at Birmingham

Department of Computer Science

About UAB Academic Integrity Code

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https://www.uab.edu/one-stop/policies/academic-integrity-code

Violations of this integrity and honor code will result in a variety of sanctions as provided in the Code. A minor offense may result in a reduced grade for the associated assignment or homework. A major offense may, at a minimum, result in the failure of the course. Repeat offenders may be expelled from UAB.

It is important to note that

1. "All students are expected to be familiar with the Academic Integrity Code and abide by it. By their continued enrollment at the University, students reaffirm their pledge to adhere to the provisions of the Academic Integrity Code."
2. Unauthorized assistance from third parties including a commercial service such as chegg.com, coursehero.com and others that may facilitate the violation of the academic integrity code, or engaging another person (whether paid or unpaid) constitutes an act of cheating and is interpreted as a major offense in the Academic Integrity Code, resulting in F in the course (see chart below). Further, students are prohibited from posting homework, assignments or examination questions to non-UAB web sites without explicit authorization by the instructor.
3. UAB requires both faculty and students uphold the standards for academic integrity. Students who witness academic misconduct have a duty to report it.

Suggested Penalties for Violations of Different Severity (Page 21 of Academic Integrity Code)

1st offense minor	1st offense moderate 2nd offense minor	1st offense major 2nd offense moderate 3rd offense any	PROPOSED SANCTION
⚑	⚑	⚑	Academic Integrity workshop
⚑			Reduced grade on assignment
⚑			Additional Course Work
⚑			Opportunity to revise/repeat
⚑	⚑		Failure of Assignment
⚑	⚑		Reduced course grade
	⚑	⚑	F in Course
	⚑	⚑	Academic Probation
		⚑	Academic Suspension

		¶	Academic Expulsion

Please also review UAB Student Code of Conduct at links below:

https://www.uab.edu/students/accountability/student-conduct-code

https://www.uab.edu/policies/content/Pages/UAB-UC-POL-0000781.html