湖北工業大學
HUBEI UNIVERSITY OF TECHNOLOGY

Course Title	Discrete Mathematics
Course Code	MATH 2331
Semester	Winter 2027, Dec. 21, 2026 - Jan. 15, 2027
Course Length	4 Weeks, 60 Contact Hours
Credits	4
Instructor	TBA
Office	TBA
Email	TBA
Prerequisite	MATH 1111 Calculus I

Course Description:

This course introduces students to the fundamental ideas that underpin discrete mathematical reasoning. Emphasis is placed on analyzing and constructing rigorous arguments, understanding formal notation, and applying proof techniques. Major topics include logic, sets, functions, relations, induction, recursion, elementary number theory, combinatorics, probability, and introductory graph theory. Students will learn to read and produce mathematically sound proofs while also exploring applications relevant to computing and the sciences.

Delivery Mode: This is a fully synchronous online course. Students are expected to attend and participate in real-time lectures and discussions, breakout activities, and problem-solving sessions.

Course Goals:

Students who successfully complete this course will demonstrate competency in the following general education core goals:

- **Critical thinking skills** – Students will engage in creative and/or innovative thinking, and/or inquiry, analysis, evaluation, synthesis of information, organizing concepts, and constructing solutions.
- **Communication skills** – Students will demonstrate effective written, oral, and visual communication.
- **Teamwork** – Students will demonstrate the ability to work effectively with others to support a shared purpose or goal and consider different points of view.
- **Social responsibility** – Students will demonstrate intercultural competency and civic knowledge by engaging effectively in local, regional, national, and global communities.

Student Learning Outcomes:

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

- read, write, and analyze mathematical arguments using precise logical and symbolic language;
- learn core methods of proof including direct proof, contradiction, and induction, and apply them to statements involving sets, functions, relations, numbers, and discrete structures;
- gain proficiency with logical reasoning, quantifiers, and rules of inference, as well as fundamental concepts in number theory, combinatorics, recursion, and graph theory;
- solve problems requiring careful reasoning, construct counterexamples when appropriate, and evaluate the validity of arguments;
- select appropriate proof strategies and apply discrete mathematical techniques to a wide range of theoretical and applied problems.

Textbooks/Supplies/Materials/Equipment/ Technology or Technical Requirements:

Susanna S. Epp. *Discrete Mathematics with Applications, 5th ed.* Cengage.

Course Requirements:

Problem Sets
Problem sets provide structured practice in logical reasoning and proof writing. Students are expected to show complete solutions, including intermediate justification and clear exposition. Assignments emphasize conceptual understanding rather than memorization.

Reading Reflections & Concept Checks
Short pre-class assignments help students prepare for upcoming topics. These reflections ask students to summarize definitions, identify unfamiliar concepts, and articulate key ideas from the textbook.

Midterm Exam
The midterm exam evaluates understanding of major units of the first half of the course, including logic, basic proof techniques, etc. Exams are administered with online proctoring via Chaoxing (超星) Smart Examination System, ensuring integrity while accommodating remote attendance. Exams include short-answer reasoning, structured proofs, and conceptual problems.

Final Exam
The cumulative final assesses the full breadth of the course, integrating proof techniques with applications across discrete structures. Like the midterm, the final exam is proctored synchronously online. Students must demonstrate the ability to formulate clear, valid arguments and apply foundational concepts to unfamiliar problems.

Assessments: Activity	**Percent Contribution**
Problem Sets	25%
Reading Reflections & Concept Checks	10%

Midterm Exam	25%
Final Exam	40%

Grading:

Final grades will be based on the sum of all possible course points as noted above.

Grade	**Percentage of available points**
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	64-69
D-	60-63
F	0-59

Course Schedule:

The schedule of activities is subject to change at the reasonable discretion of the instructor. Minor changes will be announced in class, major ones provided in writing.

MATH 2331 Schedule

Lecture	Topic	Readings
L1	Introduction to discrete structures & mathematical statements	Ch. 1
L2	Sets and basic set operations	Ch. 1
L3	Functions: definitions, images, preimages	Ch. 1
L4	Relations and equivalence relations	Ch. 1, 8
L5	Propositional logic & logical equivalence	Ch. 2
L6	Conditional statements, rules of implication	Ch. 2
L7	Boolean logic & Boolean expressions (discrete logic systems)	Ch. 2
L8	Predicate logic and quantifiers	Ch. 3
L9	Negations & nested quantifiers	Ch. 3
L10	Valid arguments & inference rules	Ch. 2-3
L11	Introduction to proof writing (direct proof)	Ch. 4
L12	Proof by counterexample and case analysis	Ch. 4
L13	Contradiction and contrapositive	Ch. 4
L14	Mathematical induction (formulas, identities)	Ch. 5
/	**Midterm Exam**	/
L15	Strong induction & well-ordering	Ch. 5
L16	Recursion and recurrence basics	Ch. 5
L17	Number theory: divisibility, primes, GCD	Ch. 4
L18	Modular arithmetic & congruence	Ch. 8
L19	Functions revisited: injections, surjections, bijections	Ch. 7
L20	Introductory group theory: sets, operations, closure, identity, inverses	Suppl.
L21	Graphs: vertices, edges, paths, cycles	Ch. 10
L22	Connectedness, Euler/Hamilton ideas (conceptual)	Ch. 10
L23	Trees and basic tree properties	Ch. 10
L24	Counting fundamentals & the pigeonhole principle	Ch. 9
L25	Connections among sets, logic, proofs, number theory & graphs	Synthesis

/ **Final Exam** cumulative

Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question and/or for the course.
Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or outside the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Other Items:

Attendance and Expectations

All students are required to attend every class, except in cases of illness, serious family concerns, or other major problems. We expect that students will arrive on time, be prepared to listen and participate as appropriate, and stay for the duration of a meeting rather than drift in or out casually. In short, we anticipate that students will show professors and fellow students maximum consideration by minimizing the disturbances that cause interruptions in the learning process.

Technology Requirements for Synchronous Learning

- A reliable internet connection.
- A computer with a webcam and microphone.
- A quiet environment suitable for participating in live lectures and assessments.

Classroom Expectations for Synchronous Sessions

- Students are expected to be logged in and ready to participate at the scheduled start time.
- To minimize disturbances, please keep your microphone muted unless you are speaking.
- Students will be responsible for their presented materials and ideas during the lecture.

Assignment Due Dates

All written assignments must be turned in at the time specified. Late assignments will not be accepted unless prior information has been obtained from the instructor. If you believe you have extenuating circumstances, please contact the instructor as soon as possible.

Make-Up Work

Make-up for tests, quizzes, or missed synchronous activities will only be offered for excused absences with valid, documented reasons (e.g., medical note, family emergency) and must be arranged with the instructor in advance where possible. The format and timing of the make-up will be at the instructor's discretion. Make-ups for unexcused absences from synchronous exams will not be granted.

Access, Special Needs and Disabilities
Please notify the instructor at the start of the semester if you have any documented disabilities, a medical issue, or any special circumstances that require attention, and the school will be happy to assist.