TIME TABLE: 45076, 45077 MWF noon–12:50pm Burnham Hall 304, from 01/12/2026 to 05/01/2026.

CREDIT HOURS: 3 undergraduate hours. 4 graduate hours.

COURSE DESCRIPTION: Introduction to Industrial Math and Computation teaches technical writing and oral presentations in preparation for industrial projects. Topics include quality control, operations research, cost-benefit analysis, differential equations, using scientific software.

Extensive computer use is required.

COURSE GOALS AND LEARNING OBJECTIVES: The goal of the course is prepare for projects in industry, science, and government. The main learning objectives are:
(1) Formulate a given problem with mathematical definitions.
(2) Apply the appropriate mathematical and computational tools.
(3) Give oral presentations and write technical reports.

PREREQUISITES: Grade of C or better in MCS 471 or consent of the instructor.

INSTRUCTOR: Jan Verschelde, Office: 1210 SEO, Phone: 312 996 4609.
Email: `janv@uic.edu`. URL: `http://www.math.uic.edu/~jan`.

OFFICE HOURS: From 1PM to 1:50PM on Monday, Wednesday, and Friday, I am sure to be in my office.

We can also make an appointment.

Online meetings are via zoom `https://uic.zoom.us/my/profjanofficehour`.

TEXTBOOK: The course is based on *Industrial Mathematics. Modeling in Industry, Science, and Government*, by Charles R. MacCluer, Prentice Hall, 2000. The textbook is optional, not required.

JULIA AND THE JUPYTER NOTEBOOK: For our computer experiments, we will use Julia.

Visit `https://julialang.org` for the starting point to learn about this new programming language. In this computational course, you will not asked to write your own implementations of the algorithms, but you must know the basic concepts of computing and programming.

The Jupyter notebook provides a convenient environment to document and structure the computations.

Answers to all homework, computer projects, and exams must be submitted in a Jupyter notebook.

CoCalc: Julia and the Jupyter notebook can be executed in the cloud, via `https://cocalc.org`.

MCS 472 SITES: See `http://www.math.uic.edu/~jan/mcs472` for slides, project descriptions, links to prerecordings of lectures, etc... Backup site: `https://janverschelde.github.io/mcs472`.

HOMEWORK: At every lecture, several exercises are listed. Some exercises provide inspiration for an interesting project. The collection of homework will be announced at least one week before the deadline.

PROJECTS: The goal of this course is the preparation for real projects in industry.
So, the realization of the projects constitutes the most important aspect of the course.
Three projects must be completed during the course, in groups of size no more than three.

The projects involve three equally important components: mathematical modeling, computational solution, and presentation (both written and oral).

To develop presentation skills, each group will select one member to deliver their report to the class in a 10 to 15 minutes slide presentation. The presentation can also be delivered by the group.

All members of the group will receive the same score on a project.

EXAMS: During the semester, there will be one midterm exam given. You may opt to skip this midterm, then greater weight will be placed on the final exam.

GRADING SCALE: 90 – 100% = A, 80 – 89% = B, 70 – 79% = C, 60 – 69% = D, 0 – 59% = F.
Your score depends for 20% on homework, 60% on the projects, and 20% on the exams.

ACADEMIC HONESTY: No student shall claim or submit the work of another as ones own. You may discuss homework and projects with others, but must finish it and write the solution yourself without looking at others' work. Allowing someone to copy from you is also punishable.

All homework and exams in this class will be individual.

For the projects, you are strongly encouraged to work in pairs.
If you work in a pair, then you must contribute your fair share to the work.

Verbatim copying the output of generative AI tools is plagiarism.
In any case, you will need to be able to understand, explain, and justify your results.

POLICY FOR MISSED OR LATE WORK: Deadlines may be postponed. If you know you will be late, then it is better to apply for an extension of the deadline, instead of not submitting anything. For missed assignments, greater weight may be placed on the final project and/or final exam.

STUDENTS WITH DISABILITIES: UIC is committed to full inclusion and participation of people with disabilities in all aspects of university life. Students who face or anticipate disability-related barriers while at UIC should connect with the Disability Resource Center (DRC) at drc.uic.edu, drc@uic.edu, or at (312) 413-2183 to create a plan for reasonable accommodations. In order to receive accommodations, students must disclose disability to the DRC, complete an interactive registration process with the DRC, and provide their course instructor with a Letter of Accommodation (LOA). Course instructors in receipt of an LOA will work with the student and the DRC to implement approved accommodations.

CLASS ATTENDANCE: Students are expected to attend all class meetings. Any changes in this syllabus or in the scheduling of exams and other assignments will be announced during class meetings.

Especially during the weeks of project presentations, you will see how other groups present their projects and learn very interesting topics.

HOW TO SUCCEED: Get to know your fellow students to the point where you can collaborate effectively. When working in groups, contribute your fair share and be a reliable, responsible partner.

One of the most important skills you will learn in this course is to take a first bite at an industrial problem. Start early, think often, do not give up too soon, and ask for help if in need.

The most important resources are those created by yourself. Make an effort to carefully write the answers to exercises, to structure your programs, and to document your computational experiments.

CLASSROOM CONDUCT POLICY: Be prepared to show your UIC i-card if requested. Respect others in the class. No cellphone usage is permitted. No food and no drinks are allowed. Students who engage in any behavior that results in the disruption of a class may be directed to leave the class room for the remainder of the class period.

SOME IMPORTANT DATES:
Monday 19 January : Martin Luther King Day. No classes.
Friday 23 January : Last day to register, last day to withdraw without W grade.
Friday 20 March : Last day for optional late drop for undergraduate students.
Monday 23 – Friday 27 March : Spring vacation. No classes.
Final exam, in the week of 4 May, to be announced.

LAST REVISED: Thursday 8 January 2026.

COURSE OUTLINE – subject to changes :

L-1	Mon 12 Jan	Welcome to MCS 472 – Statistical Reasoning
L-2	Wed 14 Jan	Statistical Distributions – Taguchi Quality Control
L-3	Fri 16 Jan	The Monte Carlo Method – averaging simulations
	Mon 19 Jan	**Martin Luther King day – no classes**
L-4	Wed 21 Jan	Proposals for Project I, Report Writing
L-5	Fri 23 Jan	Data Analysis with pandas
L-6	Mon 26 Jan	z-transforms and linear recursions
L-7	Wed 28 Jan	filters and stability
L-8	Fri 30 Jan	Bode plots, feedback, decibels
L-9	Mon 2 Feb	Sampling, properties of DFT
L-10	Wed 4 Feb	Filter design and FFT
L-11	Fri 6 Feb	Image processing with FFT
L-12	Mon 9 Feb	**Presentations of Project I**
L-13	Wed 11 Feb	**Presentations of Project I**
L-14	Fri 13 Feb	**Presentations of Project I**
L-15	Mon 16 Feb	Linear Programming
L-16	Wed 18 Feb	Regression
L-17	Fri 20 Feb	Least Squares Chebyshev and Fourier
L-18	Mon 23 Feb	Cost-Benefit Analysis
L-19	Wed 25 Feb	Microeconomics – Macroeconomics
L-20	Fri 27 Feb	review for the midterm exam
L-21	Mon 2 Mar	**Midterm Exam**
L-22	Wed 4 Mar	supervised and unsupervised Machine Learning
L-23	Fri 6 Mar	Machine Learning with scikit-learn
L-24	Mon 9 Mar	an introduction to Deep Learning
L-25	Wed 11 Mar	face recognition; ranking data
L-26	Fri 13 Mar	ordinary differential equations; the scientific method
L-27	Mon 16 Mar	**Presentations of Project II**
L-28	Wed 18 Mar	**Presentations of Project II**
L-29	Fri 20 Mar	**Presentations of Project II**
L-30	Mon 30 Mar	dynamics in mechanics and biology
L-31	Wed 1 Apr	models of pursuit; multiple mass springs and traffic; nonlinear systems
L-32	Fri 3 Apr	frequency domains, signals and plants
L-33	Mon 6 Apr	cascading plants, circuits, stability
L-34	Wed 8 Apr	filters and feedback
L-35	Fri 10 Apr	control, root locus, Nyquist analysis
L-36	Mon 13 Apr	introduction to partial differential equations
L-37	Wed 15 Apr	separation of variables: solving problems
L-38	Fri 17 Apr	trafic flow modeling
L-39	Mon 20 Apr	periodic steady state; the Helmholz equation
L-40	Wed 22 Apr	modeling vibrations by Bessel functions
L-41	Fri 24 Apr	review for the final exam
L-42	Mon 27 Apr	**Presentations of Project III**
L-43	Wed 29 Apr	**Presentations of Project III**
L-44	Fri 1 May	**Presentations of Project III**

Final exam: in the week of 4 May, date, time, and room to be announced.