Data Science Graduate Program
Student Handbook

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Welcome!

Welcome to the Data Science Graduate Program at Michigan Technological University. The Data Science program is an interdisciplinary program, meaning the faculty and courses for the program coming from all the Colleges across the University. New in 2021-2022 is that the program has a home department in the Computer Science department (part of the College of Computing). Note, the program remains interdisciplinary by design with students taking courses across the university.

The degree you seek will be challenging and give you opportunities to learn new skills, practices, and knowledge. The skills and knowledge will be the building blocks of starting a path of lifelong learning in the field of Data Science.

The degree program is a course-based curriculum, but you will get involved in many hands-on, real-world activities and projects in these courses.

I encourage you all to interact with all your fellow students and faculty. Stretch yourself and work with different students; you will have many opportunities to work in teams, reach up and pair with new students building both your technical skills and team-work and professional skills in the process. This is an opportunity to start building your professional network.

The faculty and staff are here to help you succeed. Ask questions, reach out for help. Don't wait until the end of the semester if you need assistance.

This handbook is provided as a document to answer your basic questions. For more information, please refer to the [data science website](#) and reach out to your advisor or Data Science director.

We wish you great success in the Data Science Graduate Program.

Sincerely,

Laura E. Brown
Director, Data Science Graduate Program

Program Governance

The Data Science program is managed by an inter-disciplinary community of scholars and professional staff working together to support this program.   Some of the key personnel include:

Dr. Laura E. Brown - Data Science Program Director
Home Department, College: Computer Science, College of Computing
Office: Rekhi 307, lebrown@mtu.edu

Dr. Benjamin Ong - Data Science Executive Committee
Home Department, College: Mathematical Sciences, College of Sciences and Arts
Office: Fisher 217, ongbw@mtu.edu

Dr. Guy Hembroff - Data Science Steering Committee
Home Department, College: Applied Computing, College of Computing
Director: Health Informatics Graduate Program
Office: EERC 311, hembroff@mtu.edu

Dr. Jeffrey Wall - Data Science Executive Committee
Home Department, College: College of Business
Office: AOB G010, jdwall@mtu.edu

Dr. Hairong Wei - Data Science Executive Committee
Home Department, College: College of Forest Resources and Environmental Science
Office: Noblet 176, hairong@mtu.edu

Dr. Jianhui Yue - Data Science Executive Committee
Home Department, College: Computer Science, College of Computing
Office: Rekhi 203, jyue@mtu.edu

Most inquiries can be directed towards Dr. Brown. E-mail is the preferred mode of communication.

Graduate Student Government (http://gsg.mtu.edu)

Data Science Representatives: Shubham Ayachit and Sarah Larkin

GSG representatives will communicate information regarding travel grants, social activities, opportunities and other important information. They can also be used as a contact to communicate suggestions, complaints, and help to answer questions.

Covid-19 Impacts

The whole world has seen the terrible impact of the Covid-19 pandemic on our friends, family, communities, countries, and world. Here at Michigan Tech we have had to adapt to the pandemic as well.

For those who were studying during Spring 2020 and Track A Summer 2020, the following policies impact the program rules governing the program.

- Proposal 54-20 - **Good Academic Standing:** The Graduate School recognizes the additional stressors that graduate students are under due to disruptions caused by COVID-19 are many and are strong contributors to their ability to maintain or return to good academic standing in spring 2020.
  - Graduate students who are on probation after fall 2019 or who have been reinstated for spring 2020 following a suspension can return to good standing after spring 2020 if they satisfy the conditions of good standing as defined by Senate Policy 416.1.
  - Graduate students who are on probation after fall 2019 will not be suspended if they do not return to good standing in spring 2020 as defined by Senate Policy 416.1. These students will remain on probation for their next semester of registration.
  - Graduate students who are in good standing after fall 2019 will not be placed on probation if they do not meet the standards for good standing as defined by Senate Policy 416.1. These students will remain in good standing for their next semester of registration.
  - Graduate students who began at Michigan Tech in spring 2020 do not have an academic standing. These students will be in good standing after spring 2020 regardless of whether they meet the standards for good standing as defined by Senate Policy 416.1.
- Proposal 59-20 - **Pass / Low Pass grades:** Grades will be assigned using the normal grading scheme at the end of the semester.   Graduate students will then have seven days after grades are posted to decide if they would like to switch any classes from spring 2020 to pass/fail grades (grades of SCV, LCV, or ECV). A pass grade (SCV) will be assigned for a grade of C or better. A low pass grade (LCV) will be assigned for grades of CD or D. A fail grade (ECV) will be assigned for a grade F. Once a graduate student elects the Pass/Fail option for a course and the final grade is changed, the decision is final and may not be reversed.
  - Considerations for SCV/LCV: The SCV and LCV grades will appear on your transcripts but not contribute to the cumulative GPA. SCV grades may satisfy graduation requirements (see below), but LCV grades can not.
- Proposal 60-20 - **BC/C and SCV grades:** The Graduate School and the Data Science program allows up to six credits of BC, C, or SCV grades to be used toward completion of a graduate degree. An additional three (3) credits of SCV may be allowed to count towards the degree requirements. Courses with an LCV grade will not meet degree requirements (e.g., completing a core or elective requirement), but will not negatively impact your cumulative GPA (like receiving a CD/D would). Recall, your degree completion requires a minimum cumulative GPA of 3.0.

For those who were studying during Fall 2020, the following policies impact the program.

- [Proposal 30-21](#) - **Extend Time for Completion of Incomplete**: The time to complete an "I", incomplete grade is extended one year past the end of the course.
- [Proposal 33-21](#) - **Change Date for Withdrawal with a "W"**: Students are allowed to withdraw from a course with a "W" until Friday, December 11th (extended from Friday, Nov. 6th).
- [Proposal 37-21](#) - **Pass/Low Pass/ Fail for Fall 2020**: Grades are assigned using the normal grading process. Students will then have seven days to decide if they would like to switch any classes to Pass/Low Pass/Fail grading.
  Students should talk to their advisors and others on campus about the impact of this change: GPA, course credit, academic standing, degree requirements, financial aid, transfer credit, visas, and acceptance into graduate or professional schools.

Getting Started

Listed below are several items to assist you in your orientation at MTU and the Data Science program. Some require your personal attention; others are informational only.

International Programs & Services Office (IPS)

All international students are required to report to [International Programs and Services (IPS)](#), Administration Building, Room 200 if you haven't checked in already. Bring your I-20 or DS-2019, passport and visa.

Housing Information

- [On-campus housing information](#)
- [Off-campus housing information](#)

Identification Card (HuskyCard)

All students are required to have a HuskyCard for identification and swipe access to buildings, parking lots, and residence halls if applicable. HuskyCards are issued at the HuskyCard Service Center in the IT Service Center, 1st floor of the Van Pelt and Opie Library. A valid government-issued photo ID is required, such as a driver's license, a state ID or a passport.

Office

Office space is only provided for supported GTA/GA/GRAs if required.

After-hours Access

Swipe card after-hours access to the buildings and computer labs will automatically be provided to all enrolled students. If you have been assigned an office space, you will be notified by email when your key is ready to be picked up at Public Safety & Police Services, 206 MacInnes Drive (building 16 on campus map). You will need your MTU ID card (HuskyCard) to pick up your key. If lost, you will be charged $100 for a replacement key.

Parking & Transportation

See the [Transportation Services website](#) for detailed information regarding the vehicle registration process, parking fees, and rules/regulations regarding parking. Vehicle registration/parking permit purchase is available [online](#). Bring your vehicle registration and your picture ID to Transportation Services, 100 Administration Building, to pick up your parking permit. During off-hours (4pm-7am weekdays) and all weekend, core campus parking lots and parking meters are open for parking (exception is handicap and designated parking spaces).

Winter Parking Rules

To allow for snow removal, parking is prohibited on campus between 2:00am and 7:00am, from November 1 through April 30 (regardless of if there is/isn't snow on the ground). Exceptions: Campus housing residents may park in their designated lots. Those needing to park on campus overnight can ask for and receive a special overnight parking permit from transportation services. If it is after 5 p.m. on weekdays, on a holiday, or on weekends, contact Public Safety and Police Services for parking permission. If you have car problems and are unable to move your vehicle, contact Transportation Services at 487-1441 during regular business hours (8am-5pm, Monday-Friday), and after hours, holidays, and weekends call Public Safety before the 2:00 a.m. deadline at 487-2216.

Shuttle Service

The University and local community offers multiple shuttle routes for access to campus, campus housing, and city shopping. [Shuttle routes and times information](#) is available.

Employment Information

Michigan Tech [Career Services](#) provides information that may assist students in locating employment.

International students ON-CAMPUS EMPLOYMENT

- International students must limit on-campus employment to 20 hours per week while school is in session. Students on J-1 visas must report on-campus employment to IPS.
- You cannot work off-campus without prior approval from IPS.
- You will need to apply for a Social Security Number if you have an on-campus job offer. Bring your job offer letter to IPS for further instructions.

Apply for a Social Security Number (SS# or SSN)

IPS has all the details on [employment options](#). Before accepting any kind of job, contact IPS to find out if your visa allows you to work, and about other forms and requirements that may be required including applying for a Social Security Number. Please request a receipt confirming the SSN application, and return receipt to the graduate school, Admin 411, if you have been hired as a GTA/GRA/GA.

Payroll

GTA/GRA/Fellowship/grader awardees need to be set up on payroll as soon as possible to avoid a delay in pay. Pay disbursements are issued every two weeks. Direct deposit can be set up online in Banweb under Employees, Pay Information, Direct Deposit allocation.

Fellowship recipients are paid monthly as a non-payroll disbursement. Direct Deposit can be set up for non-payroll payments online in Banweb under Employees, Non-Payroll Direct Deposit Destination.

Degree Information

The Data Science Masters is a course-based program requiring successful completion of 30 approved credits within five years of starting the program. Specifically,
- 12 credits of core courses must be successfully completed
- at least 6 credits of approved electives must be successfully completed
- at most 6 credits of foundational courses may be taken
- 6 - 12 credits of domain specific courses may be taken.

A passing grade (B or higher) must be obtained in 24 of the above 30 credits; a grade of BC or C may be accepted for the remaining 6 of the 30 credits. Additionally, at least 18 credits must be taken at the graduate level (5xxx and 6xxx).

Core Courses

The following four courses are **required** for the Data Science degree. These courses are not all offered in each semester. You will need to plan accordingly.

Fall, Spring	UN 5550*‡	Introduction to Data Science
Fall	MA 5790*†	Predictive Modeling
Fall, *Spring*✣	BA 5200*	Information Systems Management and Data Analytics
Spring	CS 5831✺	Advanced Data Mining

* Note, many students do not need to take all three core courses in their first Fall semester. UN 5550, Introduction to Data Science is recommended for a student's first semester, but the choice of the other core course should be discussed with your advisor before the semester begins.

‡ Spring admissions have been opened, therefore an additional offering of UN 5550 has been added to the Spring 2023 term, assuming minimum enrollment.

† In Spring 2022, MA 5790 was offered due to high demand. Note, the spring offering may not be available all years going forward.

✣ BA 5200 is planned to be offered Spring 2024.

✺ CS 5831 is recommended to be taken after UN 5550.

Electives

At least 2 courses, 6 credits, must be taken from the list of approved elective courses in Table 1. Note, the options have changed over the years, be sure to select courses given the year you entered the program.

Class offerings might change without notice. Please refer to the Registrar's schedule of classes for actual class offerings.

Table 1. List of Elective Courses

Course	Course Offered	Academic Year student joined the program				
		2019 - 2020	2020 - 2021	2021 - 2022	2022 - 2023	2023 - 2024
CS 5631 - Data Visualization	Fa, Sp	X	X	X	X	X
CS 5841/EE 5841 - Machine Learning	Sp	X	X	X	X	X
CS 5471 - Computer Security	Fa, Sp	X	X	X	X	X
FW 5083 - Prog. Skills for Bioinformatics	Fa, alt. years	X	X	X	X	X
MA 4710 - Regression Analysis	Fa		X	X	X	X
MA 5770 - Bayesian Statistics	Fa, alt. years	X	X	X	X	X
MA 5781 - Time Series Analysis & Forecasting	Sp	X	X	X	X	X
MGT 4600 - Management of Tech. and Innov.	Fa, Sp	X	X	X	X	X
PSY 5210 - Adv. Stat. Analysis & Design I	Fa, alt. years	X	X	X	X	X
SAT 5114 - Introduction to AI and Health	Fa	X	X	X	X	X
UN 5390 - Scientific Computing	Fa, Sp	X	X	X	X	X

Foundational Courses

A maximum of six (6) credit hours of foundational skills course may be applied to the MS in Data Science. These courses will build skills necessary for successful completion of the MS in Data Science. Some students will not need to take these foundational courses and will instead use the domain specific courses to reach the credit requirements of this program. A list of foundational courses that can be taken towards the data science program is listed on the data science website and in Table 2.

Domain Specific Courses

Appendix A contains an extensive list of domain specific courses that can be taken towards the data science program. Your remaining credits of domain specific courses, 6-12 credits, can be taken towards the data science degree.

Note: If there is a course not on the Domain Specific Course list, a student may petition the Graduate Program Director for its consideration. This petition must be submitted before the start of the semester for consideration.

Table 2. List of Foundational Courses

Course	Course Offered
CS 3425 - Introduction to Database Systems	Fall, Spring
FW 3540 - Introduction to Geographic Information Systems for Natural Resource Management	Spring
MA 3710 - Engineering Statistics	Fall, Spring, Summer
MA 3715 - Biostatistics	Spring
MA 3740 - Statistical Programming and Analysis	Fall, Spring
MIS 3100 - Business Database Management	Spring
SAT 3210 - Database Management	Fall, Summer
SAT 3611 - Infrastructure Service Administration and Security	Fall, Summer
SAT 4650 - Introduction to Applied Computing in Python Programming	Fall, Spring

Advisors

The Data Science program is an interdisciplinary collaboration across the university. All students will default to the Program Director (Dr. Brown) as their advisor.

Data Science graduate students will have an opportunity to select an advisor that matches their interest/domain background. There will be an opportunity to meet some of the advisors during the data science program orientation and early fall activities. Program orientation for fall admissions typically occurs the week before classes begin.

Advisors should typically be selected based on which domain electives you intend to specialize in. For example, if you intend to mostly take courses offered by the Math department as your domain electives, you should consider requesting Dr. Ong as your advisor. Your advisor should provide academic and career advising. Academic advising entails ensuring that your courses are suitable for your career goals and you have the necessary background to succeed in the courses. Career advising entails providing you a glimpse of what the industry in your domain specialization might look for in potential hires, connecting you with other researchers in their department/college, and potentially connecting you with recruiters.

Changing Advisors

Within the data science program, to request a change of advisor or home department, please send an email, or meet with the graduate program director to initiate the process. The current advisor and the requested advisor should be contacted prior to initiating this process.

Registration / Scheduling

The graduate course catalog is located on the Registrar's website. We recommend that your course schedule be determined in consultation with your advisor, data science director, or a member of the data

science executive committee. It is important to set yourself up for success by ensuring that you have a suitable background to succeed in this interdisciplinary program. There are various foundational courses that can help strengthen your background in statistics, business or computing. All students should take UN5550, Introduction to Data Science, in the first semester of their studies.

Information about registration can be found at the [Registrar's website](). You may register online using the Banweb system or register in person at the Registrar's Office, Room 130 of the Administration Building. Courses can be dropped or added through the first week of class without accruing any late penalty. If you have not paid for your courses by Wednesday of the first week of classes, your courses will be dropped.

Forms and Degree Completion Timelines

An important resource is the [Graduate School's Forms and Deadlines webpage](). **It is the student's responsibility to complete forms and training courses in a timely fashion**. Failure to meet submission deadlines could result in delayed completion of a student's graduate degree. NOTE: graduate students must maintain a university cumulative GPA of 3.0 or above to be eligible for graduation.

Tuition Payment

After scheduling courses, go to MyMichiganTech to receive a copy of your schedule and tuition bill. You may pay your student bill online with American Express, MasterCard or Discover (2.3% transaction fee applies) or e-check, or at the Cashier's Office located within the Student Financial Services Center in the Administration Building. Note: Credit/debit card payment not taken at Cashiers Office or by phone.

For supported students only (GTA/GA/GRA): After scheduling courses, go to Banweb to view a copy of your schedule and tuition bill. Computer fees and tuition for up to 9 credits per semester will be paid by the program for fully supported students. You are responsible for the student voted fees such as the Student Activity Fee, and Experience Tech Fee, etc.

Continuous Enrollment

Students must be enrolled every academic-year (fall and spring) semester until they complete their degree. "Completing" a degree means successfully completing all required courses and turning in all required paperwork. Graduate students are not required to register for the summer session in order to fulfill the continuous enrollment policy. However, you can enroll in summer semester courses if you desire.

** International students are further required to maintain full-time status for fall and spring semesters, as a condition of their visa. Reduced course-loads are permissible only in certain circumstances. Please refer to [documentation and forms]() required.

Career Placement

- Use the [career center]() for help with interviews and resumes. In addition, you should plan on attending the Fall and Spring Career Fairs for finding internships and job leads.

- Students are strongly encouraged to create a [Linkedin account](#) and connect with the Michigan Tech Alumni Group. Social networking can be beneficial for expanding professional associations.

- Part-time on-campus employment opportunities for students may be [available](#). The career center also maintains a list of local jobs aimed at Michigan Tech students: https://www.mtu.edu/career/students/jobs-intern/local/

Internships / Co-ops

Internships and co-ops can provide valuable experience to your data science degree, in addition to expanding your network for future job prospects.

Internships are generally offered in the summer, and while you'll be paid well and earn professional on-the-job experience, you won't earn college credit for your experience. An internship is arranged by you and a company. International students please consult with IPS whether your visa allows for such employment.

Co-ops can be arranged for any academic semester (fall, spring, summer). In addition to working full-time, you'll earn academic credit (1 to 2 credits per semester). Employers must provide you with challenging paid work related to your major.

To participate in a co-op, students must have a cumulative GPA of 3.0 or above, and adhere to [deadlines posted](#). International students must have completed two semesters before eligible for co-ops. Students should contact IPS to ensure that requirements of their visas are fulfilled and understand CPT requirements.

** Only co-ops that are relevant to your data-science program may be counted towards the academic fulfillment of your data science degree. Students who wish to count co-op experience towards the academic fulfillment of the data science degree should provide the offer letter / job description to the program director for prior approval.   If approved, up to three (3) credits of Co-op (UN 5000/ UN 5001 / UN 5002) can be counted towards academic fulfillment of the data science degree as a domain specialization elective.

University Policies

Here are some of the university policies that pertain to the data science program. A full listing of [University policies](#) is found online.

External Transfer Credits

To transfer credits from another university or college to the data science program, please be aware that :

- A maximum of ten [transfer credits](#) can be applied towards the Data Science degree unless special arrangements have been made between Michigan Tech and the second institution. The number of credits accepted depends on an evaluation by the Data Science program and the dean of the Graduate School.
- A grade equivalent of "B" or better must be earned in the course to be transferred.
- The proposed course to be transferred must be pre-approved by the Data Science Executive Committee before the end of the semester **prior** to the semester you intend to take the transfer course, and must be taken at an institution accredited by the Higher Learning Commission (HLC). The course cannot duplicate courses that have already been taken at Michigan Tech. The student will provide the name of the university, a course number, name, and description, and the **most recent** syllabus for the course. A Michigan Tech faculty member responsible for teaching the required course will be consulted as to whether the proposed course is of equivalent content.

Accelerated MS

The accelerated Masters in Data Science program is open to all high achieving undergraduate students at Michigan Tech. It allows students to double count up to six courses toward both the Bachelor's and MS degree. Students with an overall GPA of 3.0 or higher can apply for admission to the accelerated MS in Data Science program any time upon attaining junior class standing, but must apply prior to being awarded their bachelor's degree.

Students should meet with the Data Science program director and their undergraduate advisor to plan what courses may be double-counted and allowed senior rule courses. All courses counted under the senior rule and all double-counted courses applied to the accelerated MS in Data Science degree must have a grade of B or higher.

Senior Rule

Michigan Tech undergraduates may take up to [10 Data-Science approved credits hours](#) in their senior year, and use these credits towards a Data Science Masters degree. A grade of "B" or higher must be attained for these credits to count towards the graduate degree. Note, these credits do not count towards the undergraduate degree, and are independent of double-counted courses. Courses taken under senior rule are not eligible for undergraduate Federal aid.

A student must complete a senior rule form before Wednesday of week 2.

Re-using Credits

Students may double count up to 10 credits from one other Michigan Tech graduate program toward a Data Science masters degree, with the approval of the Data Science Program Director. Graduate credits earned toward the **completion** of a graduate degree at an institution other than Michigan Tech **cannot** be applied toward this degree program (this is a Michigan Tech policy).

Good Academic Standing and Dismissal

The Data Science Graduate Program follows the Graduate School policies on Good Academic Standing and Grading Policy.

Academic Grievances / Grade Appeals

Students wishing to appeal a grade assigned by a faculty member at Michigan Tech should follow the procedure described in the Michigan Tech Policy Statement under Academic Grievances.

Policies for Repeating Courses

For the data science degree, up to six (6) credits may be accepted with a BC or C grade. Overall a 3.0 GPA must always be maintained, failure to do so will result in academic probation.

Required courses can only be repeated once. If a student fails to earn a B or above in a required course after taking the required course twice, the student will be recommended for dismissal from the program. This policy applies even when the course is repeated at another institution.

Helpful Tips

Formatting Papers and Citing Research Material

All of your instructors expect you to properly cite and document sources of information in your work. Different instructors will prefer different formatting styles. Plagiarism is not tolerated and can result in dismissal from the graduate program. Be sure you are familiar with what constitutes a violation. When in doubt, please ASK your instructor or research advisor. A detailed booklet is available that describes Michigan Tech's academic integrity policy and procedures.

Skills and Research Methodology

Although the Data Science Graduate Program is course-based, there will be numerous opportunities to work with professors on current research projects. Take the initiative to engage with faculty in your area of interest. Volunteer to assist with research tasks outside of class, above and beyond class assignments. Learn the methodology being used by the researcher. Be aware that:

- Statistics and quantitative skills are critical for data scientists. Not only should you be able to use a variety of statistical tools, but you also need to be able to understand the theoretical meaning and be adept at interpreting the results in productive and insightful ways.

- Core courses will require familiarity with a number of advanced computer skills. Invest time developing a solid understanding of a computer programming language such as Python, R and SAS. This will allow you to carry out more complex data analyses.

- Writing/communication skills are *essential* to a successful career. Michigan Tech provides assistance to improve your professional writing/communication. You should treat each and every writing/communication assignment as an opportunity to improve your communication skills.

Academic Integrity

Academic integrity and honesty are central components of a student's education, and ethical conduct fostered in an academic context will be carried into a student's professional career. Academic integrity is essential in a community of scholars searching and learning to search for truth. Anything less than total commitment to integrity undermines the efforts of the academic community. Both students and faculty are responsible for upholding the academic integrity of the University. For more information about policies related to Academic Integrity, please visit the [Office of Academic and Community Conduct](#).

Appendix A: Domain Elective Courses

Applied Computing

EET	4496	Applied Machine Learning
SAT	5001	Introduction to Health Informatics
SAT	5141	Clinical Decision Support and AI Modeling
SAT	5165	Introduction to Big Data Analytics
SAT	5283	Information Governance and Risk Management
SAT	5314	Applied Machine Learning in Healthcare
SAT	5424	Population Health Informatics
SAT	5520	Machine Learning in Security
SU	5010	Geospatial Concepts, Technologies, and Data

Biomedical Engineering

BE	5870	Computer Vision for Microscopic Images

Business and Economics

ACC	5200	Financial Statement Analysis
BA	5300	Financial Reporting and Control
BA	5610	Operations Management
BA	5650	Project Management
BA	5800	Marketing, Technology, and Globalization
EC	4200	Econometrics
EC	4400	Banking and Financial Institutions
FIN	4200	Derivatives and Financial Engineering
MGT	3800	Entrepreneurship
MIS	3200	Systems Analysis and Design
MIS	4000	Emerging Technologies
MIS	4400	Business Intelligence and Analytics
MIS	4990	Special Topics in Management Information Systems
MKT	3200	Consumer Behavior & Culture
MKT	3600	Marketing Data Analytics

Chemistry

CH	4610	Introduction to Polymer Science
CH	5410	Advanced Organic Chemistry: Reaction Mechanisms
CH	5420	Advanced Organic Chemistry: Synthesis
CH	5509	Transport and Transformation of Organic Pollutants
CH	5515	Atmospheric Chemistry
CH	5516	Aerosol and Cloud Chemistry
CH	5560	Computational Chemistry

Cognitive and Learning Sciences

| PSY | 5220 | Advanced Statistical Analysis and Design II |

Computer Science

CS	4425	Database Management System Design
CS	4471	Computer Security
CS	4811	Artificial Intelligence
CS	5321	Advanced Algorithms
CS	5331	Parallel Algorithms
CS	5441	Distributed Systems
CS	5760	Human-Computer Interactions and Usability Testing
CS	5811	Advanced Artificial Intelligence
CS	5821	Computational Intelligence

Electrical and Computer Engineering

EE	5500	Probability and Stochastic Processes
EE	5521	Detection and Estimation Theory
EE	5726	Wireless Sensor Networks
EE	5821	Computational Intelligence

Forest Resources and Environmental Science

FW	5084	Data Presentation and Visualization with R
FW	5411	Applied Regression Analysis
FW	5412	Data Analysis in R
FW	5540	Remote Sensing of the Environment
FW	5550	Geographic Information Science and Spatial Analysis
FW	5555	Advanced GIS Concepts and Analysis
FW	5556	GIS Project Management
FW	5560	Digital Image Processing: A Remote Sensing Perspective

Geological and Mining Engineering and Sciences

GE	5150	Advanced Natural Hazards
GE	5195	Volcano Seismology
GE	5515	Advanced Geoinformatics
GE	5600	Advanced Reflection Seismology
GE	5870	Geostatistics & Data Analysis

Mathematical Sciences

MA	4330	Linear Algebra
MA	4720	Design and Analysis of Experiments
MA	5201	Combinatorial Algorithms
MA	5221	Graph Theory
MA	5627	Numerical Linear Algebra
MA	5630	Numerical Optimization
MA	5701	Statistical Methods
MA	5741	Multivariate Statistical Methods
MA	5750	Statistical Genetics
MA	5761	Computational Statistics
MA	5791	Categorical Data Analysis

Mechanical Engineering - Engineering Mechanics

MEEM	5010	Professional Engineering Communication

Physics

PH	4390	Computational Methods in Physics

Social Sciences

SS   5005   Introduction to Agent Based Modeling

Co-op

UN   5000   Graduate Cooperative Education I

Appendix B: Degree Schedule - Masters in Data Science

(A) Required Coursework - 12 credits

Semester	Course Number	Title	Credits	Grade
	UN 5550	Introduction to Data Science	3	
	MA 5790	Predictive Modeling	3	
	CS 5831	Data Mining	3	
	BA 5200	Information Systems Management	3	

(B) Elective Coursework - Minimum 6 credits

Semester	Course Number	Title	Credits	Grade

(C) Foundational Coursework - Maximum 6 Credits

Semester	Course Number	Title	Credits	Grade

(D) Domain Electives

Semester	Course Number	Title	Credits	Grade