WORCESTER POLYTECHNIC INSTITUTE

December 6, 2023

To: WPI Faculty
From: Mark Richman
Secretary of the Faculty

The fourth Faculty meeting of the 2023-2024 academic year will be held on **Wednesday**, **December 6, 2023 at 12:30pm in OH 107 and by Zoom at:** https://wpi.zoom.us/j/98316501886. Refreshments will be available in OH 107 at 12:15pm.

1. Call to Order — M. Richman
   - Approval of the Agenda
   - Consideration of the Consent Agenda - including the minutes from Nov. 8, 2023
2. Opening Announcements — M. Richman
3. President's Report — G. Wang
4. Committee Business:
   - Committee on Academic Operations (CAO) — S. Van Dessel
     - December 2023 Undergraduate Student Graduation List
   - Committee on Graduate Studies and Research (CGSR) — S. Olson
     - December 2023 Graduate Student Graduation List
   - Committee on Graduate Studies and Research (CGSR) — S. Olson
     - **Motion to establish an M.S. Program, a B.S./M.S. degree path, and a Certificate Program in Artificial Intelligence (AI)** — E. Rundensteiner
5. Special Report:
   - **WPI's Graduate Workers Union Agreement: An Overview for the Faculty** — T. Camesano
6. New Business
7. Provost's Report — A. Heinricher
8. Closing Announcements
9. Adjournment

TABLE OF CONTENTS

Faculty Meeting Materials, December 6, 2023

CGSR Motions:
(Note: Motions in red *are not specific to, but* <u>*support*</u> the proposed MS-AI degree program.)

WORCESTER POLYTECHNIC INSTITUTE
Faculty Meeting Minutes
November 8, 2023

Summary:

1. Call to Order; Approval of the Consent Agenda and the Minutes of October 5, 2023
2. Secretary of the Faculty's Report and Opening Announcements
3. President's Report
4. Committee Business: COG; CGSR
5. New Business
6. Provost's Report
7. Closing Announcements
8. Adjournment

Detail:

1. Call to Order

The third Faculty Meeting of the 2023-2024 academic year was called to order by **Prof. Richman** (AE) at 12:30 pm both in person and via ZOOM. Prof. Richman reminded all those in attendance that the meeting was being recorded for the sole purpose of taking accurate minutes. The meeting agenda, the minutes from the October 5th meeting, and the consent agenda were approved as posted with one minor modification.

2. Secretary of the Faculty's Report and Opening Announcements

Prof. Richman thanked Prof. Spanagel (HUA) for taking time from his fall sabbatical to serve as Parliamentarian for today's meeting. Prof. Richman also pointed out that that the next Faculty Meeting will be on Wednesday, December 6, at 12:30pm. In C-term, the faculty meetings will also be held on Wednesdays, but at 11am rather than 12:30.

Prof. Richman thanked all those who participated in the Provost Search Committee nomination. Ultimately the search committee will consist of three elected faculty members and six appointed positions done in collaboration between COG and the President. On November 9, Prof. Heineman (CS; COG, Chair) will distribute the final election ballot consisting of nine candidates for three elected positions. Appointments will be made after the results of this election are known.

Eric Beattie (VP of Facilities) announced preparations for a new campus framework plan that will help the university anticipate future needs and guide decisions about the use of campus buildings and grounds for the next 10 to 15 years. He encouraged feedback through an online survey that is open until the end of November, or through direct contact with him. He promised to report back about the survey data after it has been analyzed but before any plans are set.

3. President's Report

President Wang acknowledged the unsettling violence globally and locally and emphasized that her topmost priority is the well-being and safety of our community. She is reaching out to students, staff, and faculty to urge them to report incidents of concern. President Wang indicated that since the events in Israel on October 7, special outreach efforts have been made to our Hillel and Muslim campus community. She reminded faculty and staff that they have access to the Employee Assistance Program (EAP) for support, and she urged everyone to support one another. She noted that campus police have increased campus patrols.

President Wang also noted the financial crisis that is affecting higher education. While WPI is in reasonable financial health compared to the majority of US colleges and universities, she cautioned that WPI must remain agile, paying attention to expenses and the future. The financial crisis affects financial aid discount rates, while demographic changes are projected to result in a 15 percent reduction in high school students going to college over the next six years through 2029, with an especially hard felt effect in the northeast and midwest.

President Wang also reflected on future uncertainties due to generative AI and possible reductions in jobs. These factors could change how we provide education, do research, and deliver higher education. President Wang indicated that WPI is planning for these changes through its five strategic planning priorities including holistic attention to advances in AI and to strategies for graduate education (at the M.S. and Ph.D. level) and large-scale research.

President Wang welcomed additional feedback on the Provost job profile.

4. Committee Business

Committee on Governance (COG)

Reporting on behalf of the Committee on Governance, **Prof. Heineman** (CS, COG Chair) and **Prof. Claypool** (CS) presented a draft motion for discussion only from COG and the Working Group on Academic Freedom. This working group was charged with proposing a process for investigating and resolving alleged violations of academic freedom. **Prof. Heineman** summarized the steps the working group has taken since beginning its work in the summer. He pointed to today's draft report and encouraged everyone to read the entire motion and share feedback. The plan is to bring a revised motion for a vote at a future meeting after all feedback has been provided and considered. (See Addendum #1 on file with these minutes.)

Prof. Claypool reviewed the guiding principles that had been agreed to by faculty governance at the beginning of the work: violations are based on the definition of academic freedom in the Faculty Handbook; informal resolutions can be pursued before a formal proceeding; input from all relevant parties will be sought before deciding on a violation; nonretaliation will be guaranteed in all respects; remedies will be appropriate for the individual case; and confidentiality will be protected throughout the process and beyond. The goal is to strike a balance that would not deter those who have concerns from coming forward while also hearing from all relevant parties before deciding that a violation had occurred, and to have remedies in place for all faculty members whose academic freedom has been violated.

Prof. Claypool presented the four phases of the proposed process: 1) an initial consultation with the chair of CTAF and possibly an informal resolution; 2) investigation phase conducted by an Academic Freedom Subcommittee (AFS); 3) decision about violations, followed by confirmation of the evidence, including interviews with relevant parties; and 4) resolution phase with recommendations, remedies, and a management plan meant to protect the claimant and prevent further violations.

Prof. Claypool presented flow charts to describe the details of each phase, explaining the possible outcomes of each phase and underscoring how and where the guiding principles are reflected in the proposed process.

Prof. McNeill (Dean, Eng) asked about the Provost's options in an early tenure case arising from an academic freedom violaion. **Prof. Claypool** responded that only the JTC can table a the case of early tenure; the Provost's only options are to recommend for or against tenure.

Prof. Ryder (BBT) asked how the AFS subcommittee is chosen and whether the claimant has any influence on those choices. **Prof. Claypool** explained that the AFS is a five-member subcommittee of the nine-member CTAF and is chosen by the chair and secretary of CTAF. The claimant is not consulted, and the normal procedures for conflicts of interest would apply.

Prof. Fehribach (MA) asked if it were possible to return to an informal resolution beyond the initial stage. **Prof. Claypool** indicated that the motion explicitly allows this to happen, in addition to permitting the complainant to withdraw the complaint ant any time.

Prof. Rudolph (HUA) asked for clarification about the definition of "all relevant parties." **Prof. Claypool** explained the initial list of those who may be contacted is provided by the complainant, but that all "relevant parties" can include people not on the claimant's initial list. In the course of the investigation, the AFS identifies the parties who are relevant to the case.

Prof. Smith (IMGD) asked whether anyone involved in an academic freedom case would have to be recused from a future tenure decision involving the claimant in that case. **Prof. Claypool** stated that conflicts of interest in tenure cases are often self-declared, and he suggested that it might be best not to try to specify in the policy the exact level of involvement in an academic freedom cases that would be strictly required for a conflict-of-interest recusal.

Prof. Calli (RBE) asked about the possibility of a case happening during the tenure process, which might then require faster action. **Prof. Heineman** thought that that it was not possible foresee all possibilities but pointed out that the policy states that timeliness is essential.

Prof. Ruiz (CS) emphasized that for fairness, she wanted to be sure that the policy is written to ensure that all relevant parties would be consulted. She also advocated for the availability of training for CTAF members to learn best practices in conducting investigations.

Prof. Claypool invited faculty to an open session at the Quorum on Tuesday, November 21st from 11:30am to 1:30pm, where all relevant parties can share their thoughts with members of the working group.

Committee on Graduate Studies and Research (CGSR)

Prof. Olson (MA), on behalf of the Committee on Graduate Studies and Research and the *ad hoc* Committee on Global Health moved that a master's program in global health be established, as described in the meeting materials, and be coordinated by faculty members identified in the departments of Biology and Biotechnology, Biomedical Engineering, Computer Science, Integrative and Global Studies, Social Science and Policy Studies, as well as in the Interactive Media Game Development, Bioinformatics and Computational Biology, System Dynamics programs and in the school of Business. (See Addendum #2 on file with these minutes.)

Prof. Oates (BBT) described the proposed M.S. program. A 12-credit common core covers the foundations of global health. Four concentrations – developed based on WPI's technical strengths - allow for study in Global Health Management and Assessment; Analytics and Modeling in Global Health; Mobile Applications for Global Health; and Engineering Solutions for Global Health. All the relevant schools at WPI were consulted in developing this program.

Prof. Oates presented the learning objectives for the program and the three new courses that were developed to support the program. She illustrated the workings of the program by presenting an example of a hypothetical student in the program with a concentration in Analytics and Modeling in Global Health. Prof. Oates also outlined the plan in place to manage the program.

Prof. Troy (BME) was concerned about level of current student-demand for the proposed program. **Prof. Oates** explained that our strength in analytical skills would be the trademark for the program, and as a result she believed that it could be classified as a STEM program. Prof. Oates suggested that the program will appeal to people working in health departments and people in the biotech industry as well as those who need more preparation before being admitted to medical school.

Prof. Ruiz (CS) added that extensive market research had been done in proposing the program, which had identified a significant demand for a degree in health with an emphasis on STEM.

Prof. Hansen (HUA) was in support of the motion, and he asked about what the opportunities were for our own students to enter the program through our BS/MS option, which is not addressed in the proposal. **Prof. Oates** anticipated that upon approval of the program, each of the concentrations will have a departmental home, and that it would be the individual departments that would decide about if and how to implement a BS/MS degree path.

Michelle Borowski (Asst. Registrar/HUA) asked if there were a possibility of collaboration with other universities to include courses WPI doesn't offer. **Prof. Oates** replied that it was possible but at this point the possibility has not been included.

The motion passed.

Committee on Graduate Studies and Research (CGSR):
Prof. Olson (MA), on behalf of the Business School and the Committee on Graduate Studies and Research recommends, moved that a STEM-certified MBA in Analytics (including one new course BUS 594 Data-driven Business Strategy) be added, as described in the meeting materials.

Prof. Shah (BUS) presented the proposed program on behalf of the Business School. She described the increased demand for professionals with the mix of skills in business management, strategy, and analytics, which are featured in the proposed program. She also noted that the STEM-certification of the program will attract on-campus international MBA students. (See Addendum #3 on file with these minutes.)

Prof. Shah summarized the program requirements and explained that it requires only 36 credits (consistent with our current non-STEM online MBA program) distributed as follows: 12 credits of core courses; 6 credits of capstone courses; and 9 credits in two of four specialties (which are Data-driven Strategic Management, Applied Business Analytics, Marketing Analytics, and Operational Analytics).

The motion passed.

5. New Business
There was no new business.

6. Provost's Report
Provost Heinricher thanked the Academic Freedom Working Group for their efforts to draft a process to resolve allegations of academic freedom violations. He encouraged all faculty to look carefully at the details of the proposal. On a separate but related matter, Provost Heinricher encouraged faculty governance to consider the options that the Provost should have in early tenure cases.

Provost Heinricher encouraged all faculty members to read the report on the faculty's perspectives on Artificial Intelligence at WPI - co-authored by Prof. Smith (IMGD), Prof. Telliel (HUA), and Kimberly LeChasseur (Morgan Teach. & Learn, Cen.).

Provost Heinricher was at a recent meeting on the future of STEM education, where he reported attending a presentation by a representative from Miami Dade College on the use of project-based learning in their introductory math courses, in which they indicated that as a result of sending a team to WPI five years ago, the College had changed the way they teach all of their introductory courses.

7. Closing Announcements
There were no closing announcements.

8. Adjournment
The meeting was adjourned at 2pm by **Prof. Richman**.

Respectfully submitted,

Mark Richman
Secretary of the Faculty

Addenda on file with these minutes:
Addendum #1 - COG Motion for a Formal Procedure to Resolve Allegations of AF Violations - Minutes - Nov 8 2023
Addendum #2 - CGSR Motion for an MS in Global Health - Minutes - Nov 8 2023
Addendum #3 - CGSR Motion for a STEM-certified MBA in Analytics - Minutes - Nov 8 2023

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to approve the December 2023 undergraduate student graduation list

Motion: The Office of the Registrar reports that the following candidates have either completed all the requirements for the degree designated in the department or program indicated, or are expected to complete their degree requirements before December 30, 2023. They therefore are or will be eligible to receive that degree, and on behalf of the Committee on Academic Operations, I move that – pending final verification by the Registrar that all those on the list have in fact completed their degree requirements – they be approved for December 30, 2023 graduation.

Bachelor of Arts

Environmental and Sustainability Studies:
Sol Giesso

Interactive Media and Game Development:
Fernando Barzuna
Shawn Finnigan
Writing Concentration
Double Major

Bachelor of Science

Actuarial Mathematics:
Matthew LaCross
Celeste Rehm
Minor: Economics

Aerospace Engineering:
James Ternent
Minor: Robotics Engineering

Architectural Engineering:
Dakota Lehner
Priya Natarajan
Esrom Negash
Jonathan Nguyen

Biology and Biotechnology:
Dana Littlefield
Minor: English

Biomedical Engineering:
Vy Tran
Double Major

Business:
Kell Carlisle
General Business Concentration
Double Major

Chemistry:
Calyx Lebak

Civil Engineering:
Jack Hoover
Double Major
Shannon Logan
Michael Maffeo
Timothy Ryan

Computer Science:
Hailey Anderson
Griffin Atchue
Minor: Interactive Media and Game Development
Lucia Bernard
Philip Bui
May Dong
Michael Emerson
Lauren Fleming
Minor: Bioinformatics and Computational Biology

Computer Science cont.:
Federico Galbiati
Minor: Electrical and Computer Engineering
Miles Gregg
Nikola Grozdani
Reese Haly
Adish Jain
Sarah LaRusso
Double Major
Minor: Data Science
Joshua Malcarne
Brendan Mannion
Mirandi McCormick
Michael Oliveira
Ethan Pollack
Nathan Pollock
Vivian Reno
Chayanne Sandoval-Williams
Malik Sobodu
Haopeng Wang
Minor: Economics
Nathan Wong

Data Science:
Jared Leonard

Economic Science:
Kell Carlisle
General Business Concentration
Double Major

Electrical and Computer Engineering:
Katerina Angjeli
Molly Clem
Kena Dudac
Thomas Flanagan
Matthew Frey
Kieran Gallison
Matthew Lund
William McGurn
Minor: Computer Science
Jake Mercier
Kyle Mitard
Minor: Physics
Kosti Pano
Matthew Wong

Environmental Engineering:
Dora Evans
Sarah Hull

Industrial Engineering:
Katee Harrington
Isabella Landivar
Minor: Mechanical Engineering

International and Global Studies:
Jack Hoover
Double Major

Management Information Systems:
Veronica Deer
Sohrob Yaghouti
Minor: Computer Science

Mathematical Sciences:
Joshua Angel
Minor: Mechanical Engineering
Griffin Curley
Sarah LaRusso
Double Major
Minor: Data Science
Nicholas Mills
Double Major
Anzhe Tao
Minor: Computer Science

Mechanical Engineering:
Alferid Hussin Shifa
Minor: Robotics Engineering
Timothy Loosigian
Alexander Lucero
Nathalie Martin-Nucatola
Minor: Industrial Engineering
Edward Miller
Kenneth Niemiec
Sanjeet Pawar
Walter Rodriguez
Nicole Sanchez-Jean
Philgen Simpson
Mitra Tabandeh
Nicholas Thornton

Mechanical Engineering (cont.):
Vy Tran
Double Major
Evan Vadeboncoeur
Double Major

Physics:
Aaron Demers
Nikoloz Gegechkori
Nicholas Mills
Double Major

Professional Writing:
Shawn Finnigan
Writing Concentration
Double Major

Psychological Science:
Austin Jandrucko
Taylor Johnson
Minor: Biology
Kersten Prince
Minor: Robotics Engineering

Robotics Engineering:
Joseph Baliestiero
Peter Buterbaugh
Jared Chan
Freud Oulon
Minor: Mathematics
Evan Vadeboncoeur
Double Major

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to approve the December 2023 graduate student graduation list

Motion: The Office of the Registrar reports that the following candidates have either completed all the requirements for the degree designated in the department or program indicated, or are expected to complete their degree requirements before December 30, 2023. They therefore are or will be eligible to receive that degree, and on behalf of the Committee on Graduate Studies and Research, I move that – pending final verification by the Registrar that all those on the list have in fact completed their degree requirements - they be approved for December 30, 2023 graduation.

Doctor of Philosophy

Biology and Biotechnology:
Sabine Hahn

Biomedical Engineering:
Hamilton White
Jordan Jones

Business Administration:
Moayad Alshawmar
Haadi Mombini
Fatima Varzgani

Chemical Engineering:
Jacob Crislip
Wenxu Han
Cassandra Newton

Computer Science:
Yunsen Lei

Data Science:
Ricardo Flores
Walter Gerych

Electrical and Computer Engineering:
He Wang

Interdisciplinary:
Linda McGoldrick

Materials Science and Engineering:
Jiajun Chen
Haoxing You
Yadong Zheng

Mechanical Engineering:
Nicholas Pratt

Physics:
Jacob Bouchard

Robotics Engineering:
Shou-Shan Chiang
Alex Chiluisa
Xuan Liu
Farid Tavakkolmoghaddam

Master of Business Administration

Kodzo Agbobli
Ernest Begin
Joanna Buturlia
Ian Capozzoli
Audrey Gorgone
Bethany Houle
Salvatore Lombardo
Kedong Ma
Neha Misra
David Muse
Colleen O'Malley
Manuela Perez Luna
Tete Zhang

Master of Computer Science

Mary Barsoum
Jaime Bowen Varela
Kemari Evans

Master of Computer Science cont.

Benjamin Gavrilov
William Godsey
Matthew Letterese
Chao Wang
Ye Zheng

Master of Engineering

Biomedical Engineering:
Anthony Algieri
Katrina Garrow
Kevin Piskorowski
Madison Sanborn
Allison Smith
Siri Sundaraneedi

Electrical and Computer Engineering:
Lloyd Eze

Power Systems Engineering:
Nicholas Cellini
Emilio Cepeda
Nathan Cote
Brice Flynn
Steven Lussier
Luke McKinney
Luis Quintero
Conor Rochford
Alec Smith

Master of Mathematics for Educators

Jarred Gagnon
Zachary Marion

Master of Science

Aerospace Engineering:
Matthew Liliedahl
Tyler Lizotte
Sean McMahon
Toshak Patel
Nolan Waterman
Maria Wojciechowski

Applied Statistics:
Yichen Li
Jing Lu
Eric Murdza

Biochemistry:
Hannah Duncan

Bioinformatics and Computational Biology:
Stokley Voltmer

Biology and Biotechnology:
Sabine Hahn

Biomedical Engineering:
Cecilia Berniac
Bryhannah Young

Bioscience Management:
Monica Asca
Samantha Beddia
Mateusz Bryszkowski
Camille-Germain Duhamel
Michelle Gabriel
Marie Gedeon
Alexander Liquori
Hager Mekonen
Olivia Parkins
Walter Steiner
Erin Sullivan

Chemical Engineering:
Meshack Audu
Patrick Devine
William Garvey
Paul Jasmin
Sam Qu
Maheer Quasem
Advanced Process Engineering Concentration
Dylan Rapoport
Bioengineering Concentration

Chemistry:
Colby Johnson
Christopher Lenderink

Community Climate Adaptation:
Erin Bryan

Computer Science:
Alexander Alvarez
Gregory Conrad
Patrick Critz
Alex Friedman
Federico Galbiati
Adam Grabowski
Miles Gregg
Reese Haly
Cameron Harvey
Jiaqi Ji
Rushabh Kheni
Ian King
Humberto Martinez
Kyle McFatter
Jasper Meggitt
Yashika Mittal
Kiara Munz
Akim Ndlovu
Stephen Price
Maroli Karthik Rao
Renee Sawka
Kai Zhang

Data Science:
Danielle Angelini
Ayesha Aziz
Jennifer Belfield
Wylie Borden
Ryan Killea
Michael Klein
Jasmine Laber
Shundong Li
Shashwat Misra
Cameron Tomko
Steven Tran
River Yan

Electrical and Computer Engineering:
Mohamed Eljahmi
Jorgo Gushi
Bruce Huynh
Daniel Lewis
Eva Mailhot
Drew O'Shaughnessy
Wentao Pei
Kristi Rahman
Alan Robertson
Doua Vang
John Winship

Environmental Engineering:
Caitlin Strzegowski

Fire Protection Engineering:
Auf Alnahdi
Alexa Beach
Sean Feeney
Nicolas Hesel
Joelle Jones
Michael McMahon
Matthew Nicastro
Emily Osterloh

Information Technology:
Christopher Head

Management:
Wenqi Ma
Holly Mason
Suela Miloshi
Alex Mondro

Manufacturing Engineering:
Joshua Lambert

Materials Science and Engineering:
Anthony Florimbio
Juan Hinostroza Tamayo
Adam Murrison
Felicia Romero

Mechanical Engineering:
Ben Amado

Mechanical Engineering (cont.):
Mia Buccowich
Hayley Gray
Ryan Hawkins
Samuel Johnson
Kenneth Niemiec
Delia Smith
Amile Zaaf
Celso do Cabo

Neuroscience:
Sandaljit Randhawa

Physics:
Andrew Fitzgerald

Power Systems Management:
Paul Wildenhain

Robotics Engineering:
Ibrahim Salman Hussein Al-Tameemi
Vishrut Bohara
Kalina Bonofiglio
Brigitte Broszus
Merna Elbayoumi
Daniel Goto
Zachary Helfer
Mariya Huffman
Joel John
Saurabh Dattatray Kashid
Jonathan Landay
Joseph Lombardi
Thabsheer Jafer Machingal
Benjamin Mart
Aditya Mehrotra
Venkatesh Ravi Mullur
Peter Murray
Aditi Pawaskar
Adri Rajaraman
Radha Saraf
Michael Scalise
Naseem Shah
Shivam Sharma
Prarthana Ashok Sigedar
Mandeep Singh
Benjamin Szewczyk
Tabatha Viso
Clinton Williams

Science and Technology for Innovation in Global Development:
William Poirier

Systems Engineering:
Arsalan Akhter
Stephen Ames
Ryan Closs
Christopher Ferrari
Roger Gauthier
Brett Glendye
Eric Harper
Jason Hill
Clinton Howell
Bryce Johnson
Steve Martel
Feras Michael
Ryan Remick
Richard Saganey
Matthew Simpson
Madeline Tomastik
Daniel Wells
Jacob Westerman
Matthew Witulski

Systems Engineering Leadership:
Danielle Carter
Lois Collins
Anthony D'Accolti
Michael Gilarde
Bill Gray
Fritz Heier
Roneal Josephs
Katherine Murray
Anilkumar Narala
Sarah Pope
Jessica Tierney
Anuja Verma

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson,Chair)
Re: Motion to establish an M.S. degree, a B.S./M.S. degree path, and a Graduate Certificate program in Artificial Intelligence (AI) - including a new course CS594/DS594: Graduate Qualifying Project in Artificial Intelligence

Motion: On behalf of the Computer Science Department, the Data Science Program, and the Robotics Engineering Department, the Committee on Graduate Studies and Research recommends and I move that an M.S. degree program in Artificial Intelligence (MS-AI) be established (including one new course CS594/DS594 Graduate Qualifying Project), as described below. The program will include a B.S./M.S. path to the M.S. degree and a Graduate Certificate program in AI.

1. Description of the M.S. program, the B.S./M.S. program, and the Graduate Certificate program:

Proposed Additions to Graduate Catalog:

Master of Science in Artificial Intelligence (MS-AI)

MS-AI Program Head:
Elke A. Rundensteiner - Computer Science/Data Science

Program Goals and Objectives
To meet the growing demand for expertise in Artificial Intelligence, the Master of Science in Artificial Intelligence (MS-AI) will equip students with a strong foundation in AI. It will foster their proficiency in machine learning, deep learning, natural language processing, computer vision, and AI ethics. By providing a comprehensive and adaptable curriculum, we will prepare graduates for successful careers in the AI industry or research. Furthermore, we aspire to promote interdisciplinary collaboration by offering opportunities for students to specialize their degree to an area of interest in any discipline offered at WPI. The program balances technical expertise with its application in industry and/or government spaces via a capstone project or an MS thesis research experience. The program uses real-world experiential learning and research opportunities to ensure students are prepared for a rapidly evolving field and economic landscape.

Program Management and Faculty Involvement
As an interdisciplinary degree across three schools and many departments and programs, the MS-AI degree program will be administered by Computer Science/Data Science and by involving faculty from Robotics Engineering, with advice from the other affiliated schools and several departments and programs.

Affiliated Schools, Departments, and Programs
*School of Arts & Sciences**
School of Engineering
School of Business
Computer Science Department
Data Science Program
Robotics Engineering Department
Electrical and Computer Engineering Department
Mathematical Sciences Department
Social Science & Policy Studies
Humanities & Arts

Program management follows four levels of engagement. First, the MS-AI program head holds overall responsibility for the program. Second, an MS-AI Graduate Committee composed of one faculty member each from CS, DS and RBE will be responsible for admitting applicants into the MS-AI degree program,for academic advising of students in the program, and related tasks. Third, an MS-AI faculty advisory committee consisting of core MS-AI faculty that will help with program management, work with and advise the MS-AI program head and the MS-AI Graduate Committee, and serve on appropriate subcommittees in support of the MS-AI program, as needed. Fourth, all faculty affiliated with the MS-AI degree program, including MS-AI collaborative faculty, may offer ISP, directed study, and MS thesis credits to students in this degree program. A staff will also be assigned supporting the program and its students. New departments, programs, and faculty will be added over time based on alignment and interest.

MS-AI Graduate Committee:
Kyumin Lee - Computer Science (Data Science)
Xiangnan Kong - Data Science (Computer Science)
Carlo Pinciroli - Robotics Engineering (Computer Science)

MS-AI Faculty Advisory Committee
Berk Calli – Robotics Engineering/Computer Science
Constantinos Chamzas – Robotics Engineering
Fatemeh Emdad - Computer Science/Data Science
Loris Fichera – Robotics Engineering/Computer Science
Torumoy Ghoshal - Computer Science/Data Science
Xiangnan Kong - Computer Science/Data Science
Kyumin Lee - Computer Science/Data Science
Kevin Leahy – Robotics Engineering
Jane Li – Robotics Engineering/Computer Science
Yanhua Li - Computer Science/Data Science
Xiaozhong Liu - Computer Science/Data Science
Oren Mangoubi - Mathematical Sciences/Data Science
Fabricio Murai - Computer Science/Data Science
Chun-Kit Ngan -Computer Science/Data Science
Randy Paffenroth - Mathematical Sciences/Data Science
Carlo Pinciroli – Robotics Engineering/Computer Science
Carolina Ruiz - Computer Science/Data Science
Elke A. Rundensteiner - Computer Science/Data Science
Nitin Sanket – Robotics Engineering/Computer Science
Erin Solovey – Computer Science/Neuroscience
Roee Shraga, - Computer Science/Data Science
Jing Xiao – Robotics Engineering/Computer Science
Haichong (Kai) Zhang – Robotics Engineering/ Computer Science
Seyed Zekavat – Physics/Data Science

Collaborative Faculty for MS-AI:
Mahdi Agheli – Robotics Engineering
Emmanuel Agu – Computer Science/Data Science
Vince Aloi – Robotics Engineering
Andrea Arnold – Mathematical Sciences/Data Science
Donald Brown – Electrical & Computer Engineering/Data Science
Greg Fischer – Robotics Engineering
Neil Heffernan – Computer Science/Data Science

Bashima Islam - Electrical & Computer Engineering/Data Science
Nima Kordzadeh – School of Business/Data Science
Dmitry Korkin – Computer Science/Data Science
Greg Lewin – Robotics Engineering
Bill Michalson – Robotics Engineering
Rodica Neamtu – Computer Science/Data Science
Markus Nemitz – Robotics Engineering
Chris Nycs – Robotics Engineering
Cagdas Onal – Robotics Engineering
Daniel Reichman – Computer Science/Data Science
Andre Rosendo – Robotics Engineering
Andy Trapp - School of Business/Data Science
Jacob Whitehill – Computer Science/Data Science
Zheyang Wu - Mathematical Sciences/Data Science
Ziming Zhang – Electrical & Computer Engineering/Data Science

Admissions Requirements

Applicants are expected to have earned the equivalent of a four-year U.S. bachelor's degree with a quantitative and computational background including some coursework in programming, linear algebra and statistics. Students with bachelor's degrees in Computer Science, Data Science, Mathematics, Statistics, Electrical Engineering, Robotics Engineering, Information Technology, Business Analytics, Quantitative Sciences or other related fields are adequately prepared. Students from other backgrounds are welcome to apply if they can demonstrate their readiness through other means, such as GRE exams, professional certifications, or relevant technical work experience. The GRE is not required for admission.

Non-matriculated students may enroll in up to two courses prior to applying for admission to the Master of Science in Artificial Intelligence.

Students applying to pursue the graduate certificate in Artificial Intelligence should meet the same qualifications described above.

Requirements for the Master of Science in Artificial Intelligence (MS-AI)

Students must complete at least 30 credit hours of study in the M.S. program, which is equivalent to a minimum of ten 3-credit graduate courses. Students may select the MS thesis-option, which requires a 9-credit master's thesis, or the project-based option, which requires a 3 credit capstone project course, known as the Graduate Qualifying Project (GQP). Each student should carefully weigh the pros and cons of these alternatives in consultation with their advisor prior to selecting an option, typically in the second year of study. The department will allow a student to change between the thesis or GQP options only once. All entering students must submit a Plan of Study, identifying the courses to be taken. The Plan of Study must be approved by the student's advisor and the MS-AI Graduate Committee and must include the minimum requirements listed below. These M.S. degree requirements have been designed to provide a comprehensive yet flexible program to students who are pursuing an M.S. degree exclusively and also students who are pursuing a combined B.S./M.S. degree.

Preparatory Courses: These preparatory courses are designed for students with limited background knowledge or skills. MS-AI students may take **at most 6 graduate credits** towards the degree from these courses:

- CS 5007 Introduction to Programming Concepts, Data Structures, and Algorithms
- CS 5008 Introduction to Systems and Network Programming
- CS 5084 Introduction to Algorithms: Design and Analysis

- DS 517/MA517 Mathematical Foundations for Data Science
- DS 501 Introduction to Data Science
- DS 557 Machine Learning for Engineering & Science Applications [Cons. agenda - Dec 6, 2023]
- MIS 587 Business Applications in Machine Learning
- RBE 500 Foundations of Robotics

Core Courses: MS-AI students **must** complete a five-course core by taking one course each in the **five core MS-AI bins** in AI, ethics & AI, machine learning, knowledge representation & reasoning, and interaction & action. Students may choose to take additional core courses, beyond the five required core courses, from below bins:

- One course from the Artificial Intelligence Bin:
  - CS 534 Introduction to Artificial Intelligence [New course title, cons. agenda – Dec 6, 2023]

- One course from the Fairness, Ethics & AI Bin:
  - DS555/CS555 Responsible Artificial Intelligence [Consent agenda - Dec 6, 2023]
  - SS560 Artificial Intelligence: Exploring Technology and Policy [Cons. agenda - Dec 6, 2023]
  - MIS520 Artificial Intelligence and its Ethical Application in Business
  - WR 513 Ethical Impact and Communication in Robotics and Artificial Intelligence Research

- One course from the Machine Learning Bin:
  - CS 548 Knowledge Discovery and Data Mining
  - DS 502/MA543 Statistical Methods for Data Science
  - CS 539 Machine Learning
  - DS541/CS 541 Deep Learning
  - CS586/DS504: Big Data Analytics
  - DS551/CS551 Reinforcement Learning
  - ECE571 Machine Learning for Engineering Applications
  - ECE556/CS556/DS556 On-Device Deep Learning [Consent agenda - Dec 6, 2023]
  - ECE577/DS577 Machine Learning in Cybersecurity
  - RBE577: Machine Learning for Robotics [Consent agenda - Dec 6, 2023]

- One course from the Knowledge Representation & Reasoning Bin:
  - DS553/CS553 Machine Learning Development & Operations (ML OPS) [Consent agenda - Dec 6, 2023]
  - CS542 Database Management Systems
  - CS585/DS503 Big Data Management
  - CS 509 Design of Software Systems
  - MIS 502 Data Management for Analytics
  - OIE 559: Advanced Prescriptive Analytics
  - RBE 550 Robot Motion Planning
  - RBE 575 Safety and Guarantees in Autonomous Robotics [Consent agenda - Dec 6, 2023]
  - RBE 511 Swarm Intelligence [Consent agenda - Dec 6, 2023]

- One course from the Interaction & Action Bin:
  - DS 552/CS 552 Generative Artificial Intelligence [Consent agenda - Dec 6, 2023]
  - DS 554/CS 554 Natural Language Processing [Consent agenda - Dec 6, 2023]
  - DS 547/CS 547: Information Retrieval
  - CS 549 / RBE 549 Computer Vision
  - RBE 526/CS 526 Human-Robot Interaction
  - ECE 545/CS 545 Digital Image Processing

Capstone Project or M.S. Thesis: MS-AI students **must** complete either a three-credit capstone project experience or a nine-credit MS Thesis from the following:

- DS 598 Graduate Qualifying Project in Data Science (3 credits)
- CS 594/DS 594 Graduate Qualifying Project in Artificial Intelligence (3 credits)
- RBE 594 Capstone Project Experience in Robotics Engineering (3 credits)
- CS 599/DS 599/RBE 599 Master's Thesis (9 credits)

For the capstone project, the MS-AI student can select one of the three capstone courses based on their primary interest and with approval of their MS-AI advisor and the instructor of the course. The MS-AI student must select a capstone project focused on Artificial Intelligence, The capstone project must be approved by a faculty member affiliated with the Artificial Intelligence Program. The capstone project is most commonly done in teams, and will give students an opportunity to apply Artificial Intelligence skills to a real-world problem. It will typically be carried out in cooperation with a sponsor or an industrial partner. With permission of the instructor, a capstone course can be taken a second time for a total of 6 credits.

The MS thesis in the Artificial Intelligence Program consists of a research or development project worth a minimum of 9 graduate credit hours. Students interested in research, and in particular those who consider pursuing a Ph.D. degree in a related area, are encouraged to select the M.S. thesis option. The student can sign up for MS thesis credits such as CS599, DS599, or RBE599, as long as a faculty affiliated with the MS-AI program serves as thesis advisor and the thesis topic relates to AI. Students must submit a thesis proposal for approval by the program by the end of the semester in which a student has registered for a third thesis credit and by the advisor. Proposals will be considered only at regularly scheduled program meetings. Students funded by a teaching assistantship, research assistantship or fellowship are expected to pursue the thesis option. The student then must satisfactorily complete a written thesis and present the results to the AI faculty in a public presentation.

Elective Courses: MS-AI students may choose to take additional elective courses or other AI-related courses to reach the 30-credit requirement:

- **Other AI-related Courses:** With permission from their academic advisor, students may take any number of AI-related special topics courses such as CS525/DS595/RBE595, Independent Study (ISG) and Directed Research (CS598/DS597/RBE596) as long as related to Artificial Intelligence and offered by faculty with a core or a collaborative appointment in the MS-AI program towards the degree.

- **Electives:** MS-AI students may choose to take up to at most six (6) graduate credits in courses that are not part of the MS-AI core bins in any discipline and count them towards the M.S. degree in Artificial Intelligence. If the academic unit offering the course has restrictions associated with the course, those restrictions must be followed.

  Specialization: Students may gain a **specialization** "AI&X" by ensuring 6 elective credits in the chosen discipline are selected from **thematically-related** courses in that area that are approved by the student's Graduate Advisor. All requirements by the respective unit offering this course must be followed. These areas of specialization include, but are not limited to, the following:

  - **AI & Business:** ML for Business, Project Management, Supply-Chain Optimization.
  - **AI & Engineered Systems:** Digital Signal Processing, Medical Signal Analysis, Foundations of Robotics, Sensor Eng.
  - **AI & Foundations:** Mathematical Optimization, Multi-variate Data Analysis, Advanced Statistics.
  - **AI & Game Development:** Serious and Applied Games, Design of Interactive Experiences.

- **AI & Global Development**: Sustainability, Climate Change, Social Justice, Global Health
- **AI & Health:** BioInformatics, Health Sciences, Neuroscience, Biology.
- **AI & Human Experiences:** Human-Computer Interaction, Tangible & Embodied Interaction, Human-Robot Interaction, Visualization.
- **AI & Learning Sciences:** Foundations of Learning Sciences. Learning Environments in Education.
- **AI & Material Sciences:** Smart Materials, Nanomaterials, Manufacturing Processes
- **AI & Neuroscience:** Computational Neuroscience, Brain-Computer Interaction, Advanced Psychophysiology.
- **AI & Robotics:** Robot Dynamics, Biomedical Robotics, Soft Robotics.
- **AI & Security:** Software Security Design and Analysis, Machine Learning in Cybersecurity, Cryptography.
- **AI & Software Systems**: Adv. Software Eng., Algorithms, Mobile & Ubiquitous Computing, Distributed Systems.

Note 1: Less than 50% of the credits in the MS in Artificial Intelligence can be taken from the Business School, that is, a maximum of 14 credits of a 30-credit program. For 3-credit courses, a maximum of 4 courses may be taken from the Business School (any course with a prefix of ACC, BUS, ETR, FIN, MIS, MKT, OBC, or OIE).

Note 2: A single course cannot be used to meet two or more requirements of the MS-AI degree. For instance, if a course is used to meet one particular bin requirement, it cannot also be used to meet a second bin requirement, nor can it be counted towards fulfilling a thematically-related specialization.

The B.S/M.S. Program

Outstanding undergraduate students can earn a bachelor's degree and master's degree concurrently, and in less time than would typically be required to earn each degree separately by allowing up to 12 graduate credits to be counted towards both degree requirements. Undergraduate students can pursue a Bachelor's/Master's program, in which the Bachelor's degree is awarded in any major offered at WPI and the Master's degree is awarded as the MS-AI. Students enrolled in this joint Bachelor's/Master's program must satisfy all the program requirements of their respective bachelor's degree and all the program requirements of the MS-AI degree.

In consultation with their academic advisor, the student prepares a Plan of Study outlining the selections chosen to satisfy the Bachelor's/Master's program degree requirements, including the courses that will be double-counted. This Plan of Study must then be approved by the AI program.

Students may double-count courses towards both their undergraduate and graduate degrees whose credit hours total no more than 40 percent of the 30 credit hours (equivalent of 12 graduate credits) required for the MS-AI, and that meet all other requirements for each degree. These courses can include graduate courses as well as undergraduate 4000-level courses as long as (1) the undergraduate course covers similar material as a graduate course, (2) this corresponding graduate course satisfies the MS-AI degree program, and (3) the academic unit offering the graduate course also allows this corresponding undergraduate course to be used for BS/MS credit to satisfy this graduate course. Other 4000-level courses not meeting the above criteria and 4000-level independent study courses may be approved for double-counting for the Bachelor's/Master's MS-AI degree only through a petition and approval from the AI Program Committee.

For the relevant 4000-level courses, two graduate credits will be earned towards the joint Bachelor's/Master's degree if the student achieves grade B or higher, or otherwise with the instructor's approval. In addition, faculty may offer, at their discretion, an additional 1/6 undergraduate unit, or

equivalently a 1 graduate credit, for completing additional work in the course. To obtain this additional credit, the student must register for 1/6 undergraduate unit of independent study at the 4000-level or a 1 graduate credit independent study at the 500-level, with permission from the instructor.

Satisfying MS-AI Bin Requirements in the B.S./M.S. Program: A B.S./M.S. student may use up to 1/3 unit of undergraduate credit taken for B.S./M.S. credit to satisfy a bin requirement in the MS-AI program, if the following conditions hold: (1) the undergraduate course covers material similar to that of a graduate course, (2) this corresponding graduate course falls into one of the five core bins of the MS-AI program, and (3) the academic unit offering the graduate course allows this corresponding undergraduate course to be used for BS/MS credit to satisfy this graduate course.

Graduate Certificate in AI:

The graduate certificate in Artificial Intelligence (AI) prepares students to utilize AI technologies in real-world applications. The certificate consists of 12 credits (4 graduate courses) taken from the list of courses of the graduate MS degree in Artificial Intelligence that must satisfy the following criteria:

- At least one course must be taken from the Artificial Intelligence bin of the MS-AI degree.
- Two additional courses must be taken from two distinct core bins of the MS-AI, other than the Artificial Intelligence bin.
- The remaining credits can be earned from any of the courses approved in the MS-AI degree listed in the graduate catalog or otherwise approved by the AI program, including preparatory courses, core courses, and Special Topics courses related to AI.

The certificate courses may subsequently be applied to a degree program at WPI, including the M.S. degree in Artificial Intelligence, the MS degree in Data Science, the MS degree in Computer Science, the MS degree in Mathematical Sciences, or the MS degree in Robotics Engineering, provided that the courses meet the requirements of that degree program. Students who have completed or are currently enrolled in a graduate degree at WPI (other than Artificial Intelligence) can double count graduate credits from their graduate degree to meet up to one-third of the graduate credits for a (subsequent) Graduate Certificate in Artificial Intelligence.

2. Description of New and Modified Courses: to be added to the courses listed in the Graduate Catalog

Proposed New Course - specific to the MS-AI Program:

CS594/DS594 Graduate Qualifying Project in Artificial Intelligence *(3 credits)*
This 3-credit graduate qualifying project, typically done in teams, provides a capstone experience in applying Artificial Intelligence skills to a real-world problem. It will be carried out in cooperation with an industrial sponsor, and is approved and overseen by a core or collaborative faculty member in the Artificial Intelligence Program. This offering integrates theory and practice of Artificial Intelligence, and includes the utilization of tools and techniques acquired in the Artificial Intelligence Program to a real-world problem. In addition to a written report, this project must be presented in a formal presentation to faculty of the AI program and sponsors. Professional development skills, such as communication, teamwork, leadership, and collaboration, will be practiced. This course is a degree requirement for the Master of Science in Artificial Intelligence (MS-AI) and may not be taken before completion of 21 credits in the program. Students outside the MS-AI program must get the instructor's approval before.
Prerequisite: Completion of at least 24 credits of the AI degree, or consent of the instructor. With permission of the instructor, the GQP can be taken a 2nd time for a total of 6 credits.

List of Other New Courses - <u>specific to several programs including the MS-AI program</u>:

(<u>Note</u>: These course proposals are included in the Consent Agenda of the Dec. 6, 2023 faculty meeting, and are listed in red in the Table of Contents.)

CS552/DS552 Generative Artificial Intelligence *(3 cr.)*

CS553/DS553 Machine Learning Development & Operations (ML Ops) *(3 cr.)*

CS554/DS554 Natural Language Processing *(3 cr.)*

CS555/DS555 Responsible Artificial Intelligence *(3 cr.)*

DS 557 Machine Learning for Engineering & Science Applications *(3 cr.)*

RBE 511 Swarm Intelligence *(3 cr.)*

RBE575 Safety and Guarantees for Autonomous Robots *(3 cr.)*

RBE 577 Machine Learning for Robotics *(3 cr.)*

SS 560: Artificial Intelligence: Exploring Ethics, Policy and Technology *(3 cr.)*

ECE556/CS556/DS556: On-Device Deep Learning *(3 cr.)*

ECE 571: Machine Learning Engineering Applications *(3 cr.)*

Modified Course Title - <u>specific to several programs including the MS-AI program</u>:

(<u>Note</u>: This proposed course modification is included in the Consent Agenda of the Dec. 6, 2023 faculty meeting, and is listed in red in the table of contents.)

Current Course Title: **CS 534 Artificial Intelligence** *(3 cr.)*

Proposed Course Title**:** **CS 534 Introduction to Artificial Intelligence** *(3 cr.)*

Modified Course Prefix - <u>specific to several programs including the MS-AI program</u>:

(<u>Note</u>: This proposed course modification is included in the Consent Agenda of the Dec. 6, 2023 faculty meeting.)

Current Course Prefix: **DS 551 Reinforcement Learning** *(3 cr.)*

Proposed Course Title**:** **CS/DS 551 Reinforcement Learning** *(3 cr.)*

<u>Rationale</u>:

<u>Overview:</u>

The shortage of qualified professionals in the field of Artificial Intelligence (AI) has reached critical proportions in recent years. This deficit is primarily due to the rapid growth and transformative potential of AI technologies across various sectors of the economy. The complexity and interdisciplinary nature of AI demand a high level of expertise, making it challenging to fill positions with adequately trained individuals. Industries from technology, healthcare, finance to manufacturing are actively seeking AI talent to harness the benefits of AI-driven solutions and innovations. Without an adequate supply of AI professionals, the potential for economic and technological advancement in these organizations is compromised. Therefore, the establishment of a Master of Science program in Artificial Intelligence is a timely and strategic response to address this pressing workforce shortage and provide students with the skills and knowledge to meet the industry's demands.

We propose to launch a new program for the **Master of Science in Artificial Intelligence (MS-AI)**, with both on-campus and online delivery. The MS-AI degree will be a master's degree that allows students to

choose a path of study that focuses on learning state-of-the-art artificial intelligence techniques, applies artificial intelligence techniques, researches new techniques, or combines research with application. This program will build upon WPI's existing expertise in Artificial Intelligence across the Computer Science department, Data Science program, Robotics Engineering Department, Electrical and Computer Engineering Department, Mathematical Sciences Department, Business School, Social Science & Policy Studies, Humanities & Arts, and other departments and programs across campus. These departments and others across all schools already offer numerous courses in machine learning, deep learning, Artificial Intelligence, robotics, and other topics related to AI. This growth of AI in general and cutting-edge AI courses developed over the last 20 years in part out of Computer Science as well as numerous interdisciplinary computational degree programs on campus from IMGD, Robotics, BCB, Learning Sciences, to Data Sciences sets WPI up to offer high-caliber training and education to the future generation of AI practitioners, engineers and scientists. With this, we at WPI already offer most of the courses that would be required for the Master of Science in AI degree. Additional courses that we propose to roll out for the Artificial Intelligence degree will be cross-listed across multiple departments, as appropriate, with the aim of being mutually beneficial to students in related majors. However, unlike our existing MS degrees such as those in Computer Science, Robotics Engineering, Electrical Engineering, Mathematical Sciences, and others, this new degree allows students to focus their education in greater depth on core Artificial Intelligence courses. Unlike our current MS degrees, the Master of Science in Artificial Intelligence puts strong emphasis on the AI-related courses, while being designed to be sufficiently flexible to appeal to students who may want to apply Artificial Intelligence methods on an application domain associated with a different discipline. The program includes 1 new capstone project course created for the AI program, as well as 5 new courses, the conversion of 5 special topics courses into permanent courses, and the renaming of one existing course included in the consent agenda of the Dec 6th 2023 faculty meeting.

Unlike peer and peer-aspirant institutions, WPI provides its Master of Science in Artificial Intelligence through a blend of technical project-based classes with both theory and practice. We augment our program with important emerging themes from Responsible AI, Generative AI, Safety and Guarantees in Autonomous Robotics, to On-Device Deep Learning and offer flexible areas of specialization. The latter allows students to put tools and technologies into the context of a societal, science, engineering, or business context of interest to the student. This flexible, yet highly rigorous, approach allows us to differentiate ourselves from competing programs. We have a unique market niche through flexible background requirements and offering transition courses tailored towards supporting students with varying degrees of prior technical preparation to join the new workforce in this forever transforming workplace of the future.

Artificial Intelligence is a strategic focus research area for WPI. We obtained well over $6 million from the National Science Foundation for two NRT Ph.D. scholarship programs to train Ph.D. and MS students in data science and AI techniques, as well as future of robotics in the workplace. Our WPI faculty has obtained well over $20 million in recent research grant proposals for our faculty and students to work on Artificial Intelligence, both in fundamental methods and technique development and in applying such tools to application domains such as health, learning sciences, game development, robotics, engineering, business, and global sustainability. Given the increasing demand, a program to allow students to focus on AI is extremely timely for WPI. This will allow WPI to attract a strong talent pool by being an early mover in offering a targeted AI degree.

<u>Endorsements by Departments, Schools, and Programs Across WPI</u>:

- Computer Science Department:
  Endorsed the MS-AI degree and approved the associated Computer Science courses for inclusion in the program.
- Data Science Program:

Endorsed the MS-AI degree and approved the associated Data Science courses for inclusion in the program.

- Robotics Engineering Department:
  Endorsed the MS-AI degree program and the associated RBE courses for inclusion in the program.
- Electrical and Computer Engineering Department:
  Endorsed the MS-AI degree program and the associated ECE courses for inclusion in the program.
- Mathematical Sciences Department:
  Endorsed the MS-AI degree and approved the associated MA courses for inclusion in the program.
- Business School:
  Endorsed the MS-AI degree program and the associated business courses for inclusion in the program.
- Social Science & Policy Studies Department:
  Endorsed the MS-AI degree program and the associated SSPS course for inclusion in the program.
- Humanities & Arts Department:
  Endorsed the MS-AI degree program and the associated course for inclusion in the program.

Below we elaborate on the need for and promise of this proposed program to our students, to the participating departments, to WPI as institution, as well as to potential employers of our future MS-AI graduates.

Comparison to Existing Programs at WPI:
The new MS-AI degree program has a strong relationship with the existing Master of Science in Computer Science (MS-CS) degree, the existing Master of Computer Science (MCS), the Master of Science in Data Science (MS-DS) degree, the Master of Science in Robotics Engineering (MS-RBE) degree, and to a lesser extent the Master of Science in Information Technology (MS-IT) degree.

The MS-CS degree requires undergraduate preparation in Computer Science. It expects technical expertise in systems, algorithms, and computational theory. Such expertise is not required for many AI career options and greatly narrows the pool of applicants that could complete such a degree. Further, Computer Science students will be required to take courses related to programming languages, operating systems or networking, design, and computer theory. In contrast, MS-AI is designed to support students from broader backgrounds, as long as the applicants have basic programming and mathematical skills. The MS-AI degree does not require the three essential bins in MS-CS (algorithms, theory, and systems/networks). Instead, the MS-AI requires specific core courses in AI that are not required of MS-CS students, including Introduction to AI, Ethics & AI, and Machine Learning, among others.

While the MCS degree requires no undergraduate preparation in Computer Science, it is an applied terminal degree for professionals wanting to learn computer science skills. Computer Science students will be required to take courses related to programming, systems or networking, algorithms, software, and computer theory. In contrast, the MS-AI degree does not require the essential MCS core bins of foundations (programming, systems, networks) and design (algorithms, software, etc.) Instead, the MS-AI requires specific core courses in AI that are not required of MCS students, including Introduction to AI, Ethics & AI, and Machine Learning, among others.

Master of Science in Data Science (MS-DS) degree is an interdisciplinary degree, which is similar in terms of the background required of prospective applicants in MS-AI. However, students in the MS-DS program will be trained in three different disciplines, namely, computing (machine learning and data management),

mathematical foundations (statistical learning), as well as business (business intelligence and storytelling). MS-AI students on the other hand focus their study more on machine learning as well as other topics in Artificial Intelligence; and they are required to take Introduction to AI and Ethics & AI among other AI topics. Further, the MS in AI offers the flexibility to select an area of specialization as a 2 course thematically-related discipline to apply their AI skills towards.

The Master of Science in Robotics Engineering (MS-RBE) degree is a comprehensive degree for robotics science and systems. Prospective applicants have backgrounds in robotics, AI, CS, and related science and engineering disciplines, such as Mechanical Engineering, Electrical and Computer Engineering, Biomedical Engineering, and Physics. The degree requirements include robot dynamics and control, which are not required in the new MS-AI degree. In contrast to this, the MS-AI students may focus their study more on software and AI components of robotics. Further, MS-AI students must take Introduction to AI and Ethics & AI, among other AI topics.

The Master of Science in Information Technology (MS-IT) degree is focused on integrating technology into business. It provides students with an understanding of computing applications and relates them to organizational needs. In contrast, the MS-AI degree focuses more on the technical and computational methods for intelligent solutions, with the majority of classes and projects being oriented towards Computer Science, Data Science and/or Robotics.

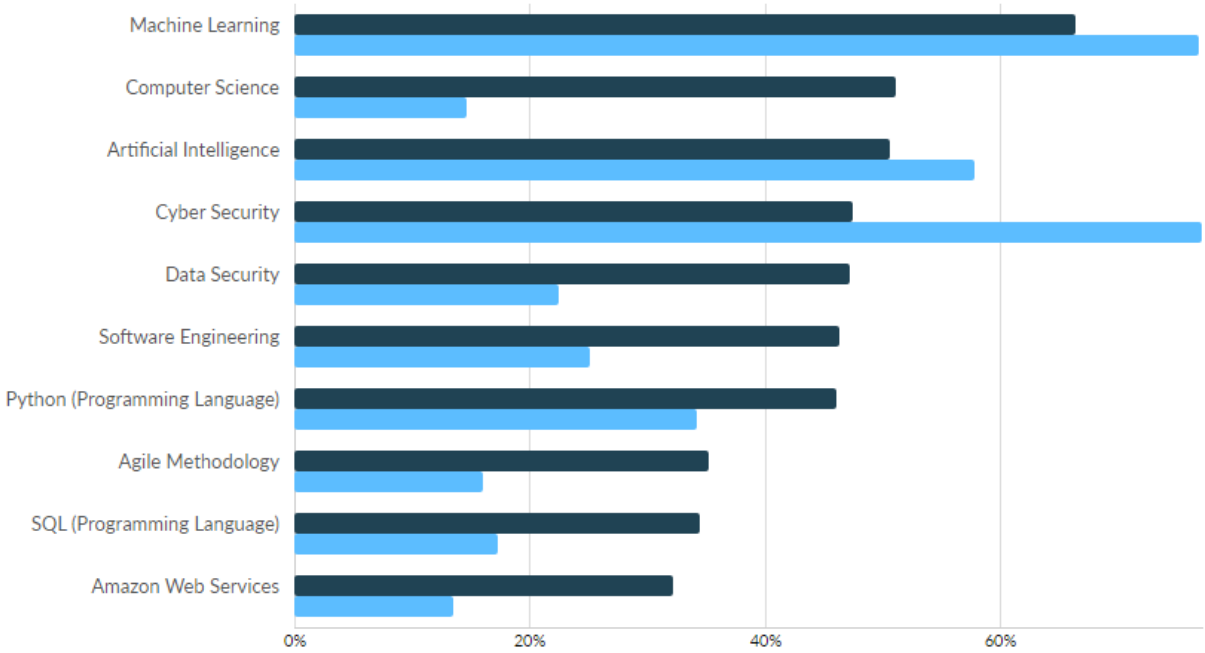
Market Analysis:
All sectors of industry and government are increasingly utilizing AI and machine learning to revolutionize their business approaches. Studies of employer needs show that demand for true "Machine Learning Engineers" and AI specialists is skyrocketing (RNL). According to the US Bureau of Labor Statistics (USBLS), they expect computer science and information technology employment to grow 11% from 2019 to 2029. This will add about 531,200 new jobs in the industry. This, it appears, is a conservative estimate, with 'AI and Machine Learning Specialists' the second on the list of jobs with increasing demand as per the World Economic Forum (WEF: the Future of Job Reports 2020. https://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf). As the industry matures, jobs in Artificial intelligence (AI) will not only grow in number but also complexity and diversity. This will open doors for various Artificial intelligence (AI) professionals—junior, senior, researchers, statisticians, practitioners, experimental scientists, and others (Springboard: https://www.springboard.com/blog/data-science/careers-in-ai/).10 Awesome & High-Paying AI Careers to Pursue in 2023 : https://www.springboard.com/blog/data-science/careers-in-ai/).

WPI has commissioned RNL (RNL) to conduct an analysis of the educational and professional landscape of AI, including Competitor Analysis, and also Program Prioritization and Positioning Study, in Sept 2023. As reported by the RNL report (page 41), they state the following related to the total number of AI Jobs: "Among 2.06 million unique job postings in the region across ALL job categories. 9,217 included "artificial intelligence" and 14,550 included "machine learning" or a total of 23,775 related postings at all levels of education. Nationwide, there was a total of 339,004 unique job postings specifically referencing either AI or machine learning. This indicates that the AI jobs in the 100-miles around WPI comprise 7 percent of all AI jobs in the U.S." The latter makes WPI and New England an attractive place to study AI and engage through our GQP project experiences with our local industry partners.

Further, related to the level of education, they found that "13,660 (of the 23,775) unique postings in the region indicate acceptance of a bachelor's degree (57%), while 9,449 (40%) indicate acceptance of a master's degree. More than 6,000 postings (25%) would accept a qualified candidate with either a bachelor's or master's degree. Note that all but 666 unique postings in AI require/prefer either a bachelor's or master's degree." Lastly, they say that "National data indicate more than 234,000 unique postings cite a preference for either a bachelor's (201,386 or 86%) or master's (124,793 or 53%). More than 91,000

postings (39%) indicate acceptance of either level degree, indicating that a considerable proportion of the national employer market welcome degrees at either level when filling AI-related jobs. These data also make clear that the national employment situation is considerably more likely to accept either level of degree than in the region.

They also note that the top specialized skills employers' ask for across both levels of education are consistent. Machine learning expertise is at the top of the list, while experience with Python, Agile Methodology, SQL and AWS are the most important programming languages and platforms to be knowledgeable about, respectively.



Competitive Programs:
Universities across the US offer M.S. degrees or graduate certificates related to Artificial Intelligence, although not necessarily titled as "Artificial Intelligence" program (e.g., Carnegie Mellon University's Master of Science in Artificial Intelligence Engineering (MS AIE) focuses on the fundamentals of AI and its application to engineered systems and Master of Science in Artificial Intelligence Engineering - Information Security focusses on its application to information security (MSAIE-IS) program). That some AI-related programs exist is not surprising considering the growing need in industry and government for this type of expertise.

In terms of local competition in the Greater New England area, Brown University has an online "Applied AI & Data Science" degree for professionals that lasts only 12 weeks and costs only ~$2,500. It is more akin to a certificate of retooling professionals to pick up a subset of critical DS and AI skills. Boston University has an "Applied Data Analytics Master's Degree" – which correspond "concentrations in Data Analytics" in the context of their existing Master of Science in Computer Information Systems, Concentration in Data Analytics (on campus and online), and Master of Science in Computer Science, Concentration in Data Analytics (on campus), and Master of Science in Health Informatics, Concentration in Applied Data Analytics (on campus and online). None of them are explicitly focused on core AI, but they closely correspond to our Data Science and/or our existing MS or Information systems degree.

Northeastern University is the closest in that it offers a Master of Professional Studies in Applied Machine

Intelligence" (NE), which offers concentrations in Business Ventures, Finance, Healthcare and Human Resources. Based on their website, their alumni seem to be employed as operations, project managers, and business developers, and in information technology, i.e., more business-focused, but not as core machine learning engineers or data scientists as our technical AI degree is targeting. Boston University's MS in Health Informatics in Applied Data Analytics is another competitor. The later focuses on AI as applied to the healthcare setting, which is an area in which students can specialize as part of our broader M.S. in AI. Boston University also offers MS in Artificial Intelligence through the CS department listed as 2023-2024. It covers as core courses in AI, algorithms, programming paradigms, machine learning, and one course on AI for HCI, followed by concentrations in a variety of areas from vision, machine learning, robotics, knowledge management and reasoning areas. AI ethics is optional as an elective. This AI degree has some relationship to our proposed MS degree and in that sense could be considered a competing program.

WPI's M.S. in AI seeks to take advantage of the University's strength in delivering programs that combine Theory and Practice, as well as the wealth of AI courses already offered in CS, DS and other academic units. The curriculum is designed to teach all students the foundational topics of AI, combined with a flexible plan of study which allows tailoring course selection in specialization areas of interest to each student.

Enrollment and Revenue Projections:
To get the initiative off the ground, we designed the program by making use of existing resources at WPI. This enables us to offer the program quickly. In addition, we have also designed a few additional courses critical for the degree. We intend to continue to grow and shape the program over time to increase its competitiveness, relevancy and attractiveness to both prospective students and to prospective employers.

Based on market analysis and review of other programs, when fully up and running we expect to attract a cohort of around 40 full-time on-campus students to this program; along with approximately 10 online students. In the first year of operation, the program is estimated to draw 20 new students, and in the second year to ramp up to 40 full-time students as a steady state. This would generate a revenue of around roughly $40 \times \$58{,}000{,}000 = \$2{,}320{,}000$ per year in a steady state.

Given the structure of the proposed program leveraging courses across other majors, including Computer Sciences, Data Sciences, ECE, RBE, Mathematical Sciences, School of Business, SSPS, and other programs teaching computational and/or machine learning type courses, there will be significant mutual benefit across these degrees. With new courses created for the AI degree, being cross-listed with other academic programs on campus such as Computer Sciences and Data Sciences – thus serving multiple populations on campus while keeping our curriculum cutting-edge. Similarly, resources in terms of faculty teaching relevant courses are also leveraged across these related degrees. This sharing of courses can lead to efficiency by ensuring even specialized courses have the requisite populations to run.

Program Assessment:
To shape the program, we plan to continuously assess the needs and interests of our student applicant pool, our existing student population, as well as survey the economic job landscape. This will include interviewing students about their interests, their perception of our program, as well as tracking their subsequent employment. Towards this end, we intend to work closely with the Advisory Board mentioned below.

We also will put a committee together during the first year of the program for assessment of the program. The charge of this committee will be to design an assessment strategy to ensure the health of the program. We intend to execute on the recommendations derived from this assessment committee in the subsequent year, as appropriate.

Industrial Ties and Advisory Board:
The Data Science program has an active Executive Advisory Board that meets twice a year with professionals in industrial, government and academic partner organizations in the areas of Data Science, AI, Data Management, Business, and Compute Systems in general. Given the relationship of Data Science with Artificial Intelligence, this board can support both the Data Science and the Artificial Intelligence degree at WPI in the near term. We intend to add two additional members to the board with a special focus on AI. These advisory board members provide us with input on industrial hiring needs, offer projects and internships to our students, and some have interest in serving as potential employers for our graduates. The companies and organizations currently on the board include Google, IBM, Microsoft, MIT Lincoln Labs, MITRE Corporation, Mass Mutual, Homesite Insurance, Mass General Brigham, Cidewalk.com, NSF, GameStop, SaaSWorks, National Grid, and MathWorks. In the long term, a separate AI Executive Advisory Board could be established if time and resources permit.

Rationale for Introducing CS594/DS594 Graduate Qualifying Project in Artificial Intelligence
This course provides an overview of many topics related to AI. This change in title aims to reflect the fact that over the years and with the introduction of this new artificial intelligence degree additional courses around AI have been and are being created, and thus this course is explicitly being indicated to be introductory course in nature.

Resources Required:
The WPI administration has committed to supply adequate resources to successfully run the MS-AI program. In particular, to support the operation of the program, the administration has authorized the recruitment of two faculty (one tenure-track faculty and one teaching track faculty) in Computer Science to support this new MS in Artificial Intelligence Degree program for the academic year 2024/2025. Similarly, a good number of the departments across all schools at WPI have also been authorized AI-related faculty hires. The administration has committed to providing support for program leadership, a staff member to assist with AI academic advising, and for marketing. Proportional to the growth of the MS-AI cohort, the MS-AI Program and affiliated schools, departments and programs will need and are expected to receive operating budget support and funds for additional instructional support. In the short term, the academic units supporting the courses in the AI Program, in particular, the Computer Science Department, the Data Science Program, and Robotics Engineering will provide support for the program, including by serving on the AI Graduate Committee to support admission, advising and related tasks. WPI will need to provide future investment in the program that is commensurate with student enrollments and thus growth of the program.

The cloud computing infrastructure requirements of these courses in terms of storage and compute power are currently met by existing resources in research computing. Additional GPU resources to be added to the WPI Turing infrastructure in 2023-2024 for support of training machine/deep learning/generative AI models have been approved by WPI. With the arrival of additional students, we will require additional computational resources (such as GPUs). Future investment in additional infrastructure is planned for by the administration based on the growth of the program.

Impact on Existing Programs at WPI:
The proposed MS-AI overlaps with existing programs in Computer Science, Data Science, Mathematical Sciences Department, Business School, Electrical and Computer Engineering Department, Robotics Engineering Department, and other degree programs. Students may decide to switch from either MS program to the MS-AI program or vice versa through the graduate admissions process. However, we expect there will be new students that will be particularly interested in learning about AI techniques and their application to solving cutting-edge problems in business, engineering, and sciences. This population of students will be attracted to WPI and will apply for the MS-AI directly.

Students may participate in the MS-AI through the BS/MS program – retaining our undergraduate students across a variety of majors to continue on with their graduate education. They may apply credit from certain undergraduate courses towards the MS-AI as specified above.

Implementation Plan:

On-campus: Implementation date for this new program is the start of the 2024-2025 academic year. Upon approval by the WPI faculty, we will begin efforts to recruit students to join the program in Fall 2024.

Online: Our initial implementation will be in person. If additional resources are secured, we may proceed with an online implementation, which would likely then be spread over two years.

Timeframe	Milestone
Fall 2023	Approval by departments, programs. Approval by CGSR and WPI Faculty
AY 2023-2024	• Design and development of subset of the newly proposed courses. • Marketing specialist develops web presence for program and degree. • Recruiting of two AI faculty members in CS.
December 2023	Availability of the expected AI program starts to be announced to prospective students.
Spring 2024	Setup of registration processes, webpages, and other externally facing materials. Admissions reviews of applicants into the program, if processes allow.
Fall 2024	Recruited new faculty join the program. In the best case, newly admitted students start taking classes.
AY 2024-2025	• First year majors and listed courses in AI are offered. • Program designs and develops additional courses to enrich options.
AY 2025-2026	Offer second year of program with extended course offerings

Appendix: References

(USBLS) US Bureau of Labor Statistics, 2019. AI and Machine Learning.

(WEF) World Economic Forum: The Future of Job Reports 2020. (https://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf).

(Springboard) Springboard: https://www.springboard.com/blog/data-science/careers-in-ai/). 10 High-Paying AI Careers to Pursue in 2023: https://www.springboard.com/blog/data-science/careers-in-ai/
(RNL 2023) Custom report, produced by RNL, Artificial Intelligence +, Competitor Analysis Program Prioritization and Positioning, Study commissioned by WPI in consideration of AI job market and programs. 2023.

(NE) Northeastern, Applied Machine Learning, https://catalog.northeastern.edu/graduate/professional-studies/masters-degree-programs/applied-machine-intelligence mps/?_gl=1*1dkev*_gcl_

Appendix
Consent Agenda Motions

(see next page)

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course description of PSY1400 Introduction to Psychological Science

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course description of PSY 1400: Introduction to Psychological Science be modified as described below.

Description of the Proposed Modifications:

Current Course Description:

PSY 1400: Introduction to Psychological Science *(Cat I)*
Psychological science is the experimental study of human thought and behavior. Its goal is to contribute to human welfare by developing an understanding of why people do what they do. Experimental psychologists study the entire range of human experience, from infancy until death, from the most abnormal behavior to the most mundane, from the behavior of neurons to the actions of nations. This course offers a broad introduction to important theories, empirical findings, and applications of research in psychological science. Topics will include: use of the scientific method in psychology, evolutionary psychology, behavioral genetics, the anatomy and function of the brain and nervous system, learning, sensation and perception, memory, consciousness, language, intelligence and thinking, life-span development, social cognition and behavior, motivation and emotion, and the nature and treatment of psychological disorders.

Proposed Revised Course Description:

PSY 1400: Introduction to Psychological Science *(Cat I)*
This course is intended for anyone interested in learning about the different areas of psychological science. Psychological science is the scientific examination of human thought and behavior. In other words, psychologists try to understand why people do what they do. This course offers an introduction to different areas and topics within psychological science. Topics may include: the brain, sensation, perception, learning, memory, language, intelligence, development over the lifespan, social cognition and behavior, motivations, emotions, mental health, methodology & statistics. No prior experience in psychology is needed.

Rationale:
The course description was revised to state more clearly who the course is intended for and what it will cover. It was also changed to allow some freedom for different instructors to emphasize different topics.

Impact on Students: None

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course description of PSY1504 Strategies for Improving Cognitive Skills

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course description of PSY 1504: Strategies for Improving Cognitive Skills be modified as described below.

Description of the Proposed Modifications:

Current Course Description:

PSY 1504: Strategies for Improving Cognitive Skills *(Cat I)*
Life experience provides us with little insight into the basic workings of our own minds. As a result, we tend to approach many of the important problems and decisions of our professional and personal lives with only a dim awareness of the limitations and capabilities of the human cognitive system and how its performance can be improved. The purpose of this course is (1) to provide students with the basic psychological knowledge needed to understand and evaluate such important cognitive skills as memory, problem solving, decision making, and reasoning and (2) to provide students the practical skills and experience necessary to improve and assess their cognitive performance. Topics will include but not be limited to memory improvement, study skills, effective problem solving techniques, creativity, numeracy, making effective choices, risky decision making, dynamic decision making, intelligent criticism of assumptions and arguments, and evaluating claims about the mind. Suggested background: PSY 1400.

Proposed Course Description:

PSY 1504: Strategies for Improving Cognitive Skills *(Cat I)*
This course is intended for anyone interested in learning more about how the mind works and how to make it work better. The purpose of this course is (1) to provide students with the basic psychological knowledge needed to understand and evaluate such important cognitive skills as memory, problem solving, and decision making, and (2) to provide students the practical skills and experience necessary to improve and assess their cognitive performance. Topics will include but not be limited to: memory improvement, study skills, problem solving techniques, creativity training, brainstorming, making effective choices, evaluating claims about the mind, and cognitive health. No previous experience with psychology is needed.

Rationale:
The course description was revised to state more clearly who the course is intended for and to update the topics covered to better reflect how the course is currently taught.

Impact on Students: None

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course description of PSY2401 The Psychology of Education

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course description of PSY 2401: The Psychology of Education be changed as described below.

Description of the Proposed Modifications:

Current Course Description:

PSY 2401: The Psychology of Education *(Cat II)*
This course is concerned with the learning of persons in educational settings from pre-school through college. Material in the course will be organized into five units covering a wide range of topics: Unit 1: Understanding Student Characteristics - Cognitive, Personality, Social, and Moral Development; Unit 2: Understanding the Learning Process - Behavioral, Humanistic, and Cognitive Theories of Learning; Unit 3: Understanding Motivation to Learn; Unit 4: Understanding Student Diversity - Cultural, Economic, and Gender Effects upon Learning; Unit 5: Evaluating Student Learning - Standardized Tests, Intelligence, Grades, and other Assessment Issues. Students planning IQPs in educational settings will find this course particularly useful. Instructional methods will include: lecture, discussion, demonstration, and project work. Course will also focus on current issues in technological education and international higher education. Recommended background: PSY 1400 or PSY 1401. This course will be offered in 2016-17, and in alternating years thereafter.

Proposed Course Description:

PSY 2401: Psychology of Education *(Cat II)*
This course is intended for anyone who wants to understand how people learn in educational settings. This class covers select topics from educational psychology, including theories of learning from cognitive science and learning science, evidence of effective study strategies and educational practices, as well as how non-academic and social factors can influence student experiences and achievement in education. The course will also cover common misconceptions in education that are not supported by research. Students will read journal articles on central topics in educational psychology and complete assignments designed to apply concepts learned in class. No prior experience with psychology is needed to take this course. This course will be offered in 2024-25, and in alternating years thereafter.

Rationale:
The course description was revised to state more clearly who the course is intended for and to update the topics covered to better reflect how the course is currently taught.

Impact on Students: None

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the title and course description of PSY2406 Cross Cultural Psychology: Human Behavior in Global Perspective

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the title and course description of PSY 2406: Cross Cultural Psychology: Human Behavior in Global Perspective be modified as described below.

Description of the Proposed Modifications:

Current Course Description:

PSY 2406: Cross-Cultural Psychology: Human Behavior in Global Perspective *(Cat II)*
This course is an introduction to the study of the ways in which social and cultural forces shape human behavior. Cross-Cultural psychology takes a global perspective of human behavior that acknowledges both the uniqueness and interdependence of peoples of the world. Traditional topics of psychology (learning, cognition, personality development) as well as topics central to social psychology, such as intergroup relations and the impact of changing cultural settings, will be explored. Cultural influences on technology development and transfer, as they relate to and impact upon individual behavior, will also be investigated. Students preparing to work at international project centers, International Scholars, and students interested in the global aspects of science and technology will find the material presented in this course especially useful. Recommended background: PSY 1400 or PSY 1402. This course will be offered in 2016-17, and in alternating years thereafter.

Proposed Course Description:

PSY 2406: Cross-Cultural Psychology *(Cat II)*
Why do people stand so close to you in other countries? Why should you avoid eating with your left hand in some places? Why do people drive on the left side of the road in some countries? How does your nationality influence the way you think about food? How is the U.S. viewed by other countries? In this course, we will explore these questions and many more as we learn about cross-cultural psychology. Cross-cultural psychology is the study of cultural effects on human behavior and diversity. We will examine theoretical perspectives and empirical findings in cross-cultural psychology. This course will cover topics such as: development, understanding the self, cognition, communication (verbal and nonverbal), emotion, relationships, prejudice, gender, mental and physical health, and what it means to live and work in a diverse and multicultural society. We will examine these issues both within the cultural groups in the United States as well as cultures around the globe. This course is designed to increase awareness and sensitivity to issues pertaining to diversity and differences among people and to allow for discussions on these sensitive topics. No prior experience with psychology is needed to take this course.
This course will be offered in 2024-25, and in alternating years thereafter.

Rationale:
The course description was revised to state more clearly who the course is intended for and to update the topics covered to better reflect how the course is currently taught. The title was shortened as cross-cultural psychology is an established subfield and the longer title was deemed unnecessary and redundant.

Impact on Students: None

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course description of PSY/ENV 2500: Psychology of Sustainability

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course description of PSY/ENV 2500: Psychology of Sustainability be modified as described below.

Description of the Proposed Modifications:

Current Course Description:

PSY/ENV 2500: Psychology of Sustainability *(Cat II)*
This course applies psychological theory and research to understand the causes of human behavior that degrades natural systems and to identify and promote more sustainable actions and policies. Topics will include: social dilemmas and cognitive limitations as root causes of environmental problems; psychological methods for studying sustainability; the potential for and limitations of changing individual environmental cognition and behavior; environmental knowledge, attitudes, and values; motivations for sustainable behavior; and the relationship between environmental quality and human health and mental health. Students will gain experience applying social and cognitive behavior change strategies to reduce their own environmental impact. Suggested background: introductory psychology and/or environmental studies. Students may not receive credit for both ENV2400 and ENV/PSY2500.This course will be offered in 2021-22, and in alternating years thereafter.

Proposed Course Description:

PSY/ENV 2500: Psychology of Sustainability *(Cat II)*
This course is intended for anyone interested in human behavior and sustainability. This course applies psychological theory and research to understand the causes of human behavior that degrades natural systems and to identify and promote more sustainable actions and policies. Topics will include: social dilemmas and cognitive limitations as root causes of environmental problems; psychological methods for studying sustainability; the potential for and limitations of changing individual environmental cognition and behavior; environmental knowledge, attitudes, and values; motivations for sustainable behavior; and the relationship between environmental quality and human health and mental health. Students will gain experience applying social and cognitive behavior change strategies to reduce their own environmental impact. Students may not receive credit for both ENV2400 and ENV/PSY2500. No prior experience in psychological science or environmental studies is needed to take this course. This course will be offered in 2025-26, and in alternating years thereafter.

Rationale:
The course description was revised to state more clearly who the course is intended for.

Impact on Students: None

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course description of PSY/GOV 3000: Psychology and Law

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course description of PSY/GOV 3000: Psychology and Law be modified as described below.

Description of the Proposed Modifications:

Current Course Description:

PSY/GOV 3000: Psychology and Law *(Cat II)*
How does the courtroom work and where does psychology come into play? Is it really "innocent until proven guilty"? Do people confess to crimes they never committed? How accurate are eyewitnesses? In this course, we will discuss and examine questions like these and many more. This course examines empirical research in the interface of psychology and law. We will learn about standard practices in the criminal justice system and empirical psychological research devoted to understanding these practices. As a discussion-based course, we will tackle topics such as: courtroom procedures, confessions, death penalty, deception, decision making, deliberations, eyewitnesses, expert testimony, jury selection, memory, police, and pretrial publicity. We will also explore how and when psychologists can impact legal guidelines and policies. Recommended background: Introduction to Psychological Science (PSY 1400), Social Psychology (PSY 1402) and/or Cognitive Psychology (PSY 1401). Courses in Government and Policy Studies will also be beneficial.

Proposed Revised Course Description:

PSY/GOV 3000: Psychology and Law *(Cat II)*
How does the courtroom work and where does psychology come into play? Is it really "innocent until proven guilty"? Do people confess to crimes they never committed? How accurate are eyewitnesses? In this course, we will discuss and examine questions like these and many more. This course examines empirical research at the interface of psychology and law. We will learn about standard practices in the criminal justice system and empirical psychological research devoted to understanding these practices. As a discussion-based course, we will tackle topics such as: courtroom procedures, confessions, death penalty, deception, decision making, deliberations, eyewitnesses, expert testimony, jury selection, memory, police, and pretrial publicity. We will also explore how and when psychologists can impact legal guidelines and policies. This course is intended for psychology majors, psychology minors, and students studying government, law, and/or policy studies. This course will be offered in 2025-26, and in alternating years thereafter.
Recommended background: Introduction to Psychological Science (PSY 1400), Social Psychology (PSY 2402), or Cognitive Psychology (PSY 2403). Courses in Government and Policy Studies will also be beneficial.

Rationale:
The course description was revised to state more clearly who the course is intended for.

Impact on Students: None

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course description of PSY 4110: Psychophysiology

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course description of PSY 4110: Psychophysiology modified as described below.

Description of the Proposed Modifications:

Current Course Description:

PSY 4110: Psychophysiology *(Cat II)*
The field of Psychophysiology seeks to answer two key questions: (1) How do psychological factors – like our feelings, attitudes, relationships, behaviors, and social environments – get "under the skin" to affect our physiology? (2) How can we infer someone's psychological state based on a physiological measurement? For instance, how do different stimuli affect our heart rate? And in turn, if someone's heart is beating faster, might we infer that they are nervous or that they are excited? In this course, we will cover fundamental stress physiology (e.g., the nervous system, neuroendocrinology, the immunity system etc.), advanced methodologies for assessing psychophysiological constructs (e.g., electromyography, neuroimaging, biospecimens), and both foundational and emerging findings from the field. Ultimately, this course will teach students to make strong inferences about the links between the psychological experience and the body's physiological reactivity and to understand the broader implications of these links.
Recommended background: PSY1402: Social Psychology and/or PSY2408: Health Psychology

Proposed Revised Course Description:

PSY 4110: Psychophysiology *(Cat II)*
This course is intended for students interested in the integration between psychology and physiology and will be especially useful for students pursuing degrees and careers in psychology, biology, healthcare, biomedical engineering, and neuroscience. The field of Psychophysiology seeks to answer two key questions: (1) How do psychological factors get "under the skin" to affect our physiology? (2) How can we infer someone's psychological state based on a physiological measurement? This course covers topics relevant to fundamental stress physiology (e.g., the nervous system, neuroendocrinology, the immunity system etc.), advanced methodologies for assessing psychophysiological constructs (e.g., neuroimaging, electromyography, biospecimens), and both foundational and emerging findings from the field. Students will develop an integrated knowledge of the core anatomy and activities of physiological systems relevant to psychology, the primary methodologies used in psychophysiological research, and key relationships between psychological factors and physiological outcomes. They will also learn to apply this knowledge to critically examine scientific research and literature and contextualize psychophysiology research into real-world trends in health and illness. This course will be offered in 2024-25, and in alternating years thereafter.
Recommended background: PSY2402: Social Psychology and/or PSY3408: Health Psychology

Rationale:
The course description was revised to state more clearly who the course is intended for and to update the topics covered to better reflect how the course is currently taught.

Impact on Students: None

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Overall Rationale for Renumbering Undergraduate Courses in the Psychological & Cognitive Sciences program:

Overall Rationale for Renumbering Undergraduate Courses in the Psychological & Cognitive Sciences Program:

In 2022-23 the Psychological and Cognitive Sciences Program conducted an evaluation of the course offerings and their level at peer institutions. Peer institutions included: Holy Cross, Assumption University, RPI, RIT, Bates College, Tufts University, Rice University, University of Virginia, and Penn State. It became evidence based on the results from this study that there are large inconsistencies with the numbering/level of courses at WPI, and the Psychological & Cognitive Sciences Program would like to renumber courses to be more consistent with peer institutions to assist students if they choose to transfer courses in or out of WPI and with Graduate School applications and admission. In addition, through conversations with current students, it is clear students are not always sure how to interpret the Recommended Courses. Therefore, all course descriptions have been re-written to clearly state *who* the class is intended for (e.g., anyone, Psych Majors and Minors, etc.). To provide an overview of the requested changes, we provide Table 1 to showcase all changes requested. Table 2 provides an overview of the current course offerings based on numbering and the proposed numberings.

Our comparison study revealed that typical course numbering in Psychological Science is organized by the depth of topic: 1) 1000-level courses are introductory courses that survey across much of the field, 2) 2000-level courses are survey courses that deeper dive into a specific topic/subfield within Psychology (e.g., Social Psychology; Cognitive Psychology), 3) 3000-level courses tend to be more discussion-based courses that explore a topic within (or across) a subfield—especially emerging, developing, and evolving fields (e.g., Psychology and Law), and 4) 4000-level courses tend to be related to research methodology, data analysis, or higher-level discussion oriented courses that focus on a very specific topic and are intended to overlap or get students ready for graduate level course work (e.g., Psychophysiology). It was also noted in the review of peer institutions that research methodology and statistics courses were offered in the 200/2000, 300/3000, and 400/4000 level. The rationale for lower numbering was to get students engaged in these courses earlier in their time of study. Higher numbering occurred when the courses focused on engaging students in the research itself (e.g., research projects) and preparing students for senior thesis or graduate work.

In addition, informal interviews with undergraduate students were conducted. Results from this informal qualitative study revealed confusion with the current listing of Recommended courses. Undergraduate students commented that they read Recommended courses as courses that were required to be taken before taking the course of interest. Undergraduate students also commented that discussions with peers and advisors suggested the recommended courses should be treated more like pre-requisites than possible recommendations. Therefore, all course descriptions have been re-written to clearly state *who* the course is intended for and what it will cover.

Impact on students:
The revised course descriptions should be very helpful to students and advisors in determining whether a course is intended for the student or not and if they should take it.

The revised course numbering should have minimal impact on students. It may initially cause some confusion if a student has taken the course at a previous level (e.g., PSY 1402 Social Psychology instead

of PSY 2402: Social Psychology). All Psychological and Cognitive Sciences faculty were involved in the renumbering project and should be able to provide help and advice to those with questions.

The revised numbering will have benefits to majors and minors in Psychological Science. The changes will better reflect peer institutional practices. This will make the transfer of classes in and out of WPI easier. This will also help all students applying to graduate programs as the course numbering will more likely be compatible with peer institutions and less documentation to confirm that a course is similar to a course at the peer institution will be needed. It will also help students pursuing B.S./M.S. at WPI as more 4000-level courses will be available.

Impact on program:

Psychological and Cognitive Science courses at WPI are very popular. Most classes are capped at 50-55 students (depending on the room they are scheduled in), and most 1000 and 2000 level courses fill to capacity and have a waitlist. In the 2022-2023 Academic Year, we offered the following courses with enrollments:

> **A Term 2022:** PSY 1400: Intro to Psych Science (50 enrolled and Waitlist); PSY 1412: Mental Health (49 enrolled); PSY 3400: Survey Methods (20 enrolled, 35 cap)
>
> **B Term 2022:** PSY 1401: Cognitive Psychology (44 enrolled), PSY 2406: Cross Cultural Psychology (35 enrolled), PSY 2800: Social Neuroscience (28 enrolled, 30 cap)
>
> **C Term 2023:** PSY 1401: Cognitive Psychology (50 enrolled and Waitlist); PSY 1402: Social Psychology (46 enrolled); PSY 2401: Psychology of Education (36 enrolled, 36 cap and Waitlist); PSY 2504: Human Sexuality (41 enrolled, 40 cap and Waitlist)
>
> **D Term 2023:** PSY 1400: Intro to Psych Science (49 enrolled); PSY 1404: Developmental Psych (52 Enrolled and Waitlist); PSY 1412: Mental Health (44 enrolled); PSY 1504: Strategies for Improving Cog Skills (47 enrolled); PSY 2408: Health Psychology (34 enrolled; 35 cap)

Given the popularity of the lower-level courses, we do not anticipate major reductions in enrollments as the current 1000 and 2000 level courses have similar caps and similar enrollment trends. No enrollment caps are being changed as a result of the proposed renumbering. The content and pedagogy of the courses are also not generally changing, with the exception of School Psychology; rather the proposed new course numbers better reflect how the courses are currently taught. The revised course descriptions have been written to include statements to make it clear to students seeking to use the proposed 2000 level courses for their social science requirement that there are no barriers to their enrollment and success. We will also work closely with the Office of Academic Advising to communicate this to students and advisors. In addition, we do not anticipate significant changes in enrollment as numerous courses are counted in other programs. PSY 1400: Intro to Psych Science is required and PSY 1402: Social Psych and PSY 2408: Health Psych are recommended for Pre-Health students. PSY 2408: Health Psychology is also required for the Global Public Health Minor. PSY 2407: Psychology of Gender and PSY 2504: Human Sexuality are part of the Gender, Sexuality, and Women's Studies Minor. Several courses are cross listed with other disciplines (e.g., PSY/ENV: Psych of Sustainability 2500, PSY/GOV 3000: Psych and Law, and PSY/MU 2501: Music and Mind). Several courses are also part of the Teacher Prep Program at WPI (we are working on expanding the options for these students as well). No change in enrollment is expected for courses moving from the 3000 to the 4000 level, as the students taking these courses are almost exclusively psychology majors and minors, and the role of the courses in meeting distribution requirements is not changing. It is possible that enrollment of non-psychology students might decrease somewhat for courses moving from the 2000 to 3000 level. We have the flexibility to adapt to that potential outcome by increasing the enrollment caps and frequency of 1000 and 2000 level courses to compensate, if necessary.

The renumbering of the courses will benefit the program by providing better alignment between WPI's Program and peer institutions. Likewise, it will benefit majors and minors in the program by providing a diversified curriculum with more upper-level course opportunities, including more 4000-level courses that could assist B.S./M.S. students.

The renumbering will **not** require updates to the current Major requirements. Note 1 of the distribution requirements reads: "Must include introductory psychology, social psychology, cognitive, psychology, and experimental design." These courses will remain required. Since no numbers are used in Note 1, the only change will be to the tracking sheet to update their numbers.

Table: Overview of Current Course Numbering and Revised Course Number:

Existing Course Offerings	Proposed Course Offerings
PSY 1400: Introduction to Psychological Science	PSY 1400: Introduction to Psychological Science (No Change)
PSY 1504: Strategies for Improving Cognitive Skills	PSY 1504: Strategies for Improving Cognitive Skills (No Change)
PSY 1402: Social Psychology	PSY 2402: Social Psychology
PSY 1404: Developmental	PSY 2404: Developmental Psychology
PSY 1412: Mental Health	PSY 2412: Mental Health
PSY 2401: The Psychology of Education	PSY 2401: The Psychology of Education
PSY 2406: Cross-Cultural Psychology: Human Behavior in Global Perspective	PSY 2406: Cross Cultural Psychology
PSY 2407: Psychology of Gender	PSY 3407: Psychology Gender
PSY 2408: Health Psychology	PSY 3408: Health Psychology
PSY/ENV 2500: Psychology of Sustainability (formerly ENV 2400)	PSY/ENV 2500: Psychology of Sustainability
PSY/MU 2501: Music and Mind	PSY 2501: Music and Mind
PSY 2504: Human Sexuality	PSY 3504: Human Sexuality
PSY 2410: School Psychology	PSY 4120: School Psychology
PSY/GOV 3000: Psychology and Law	PSY/GOV 3000: Psychology and Law
PSY 3400: Survey Design and Methodology	PSY 4400: Survey Design and Methodology
PSY 3500: Experimental Design and Analysis	PSY 4500: Experimental Design & Analysis
PSY 4110: Psychophysiology	PSY 4110: Psychophysiology

Note:
Current Distribution: 5 1000-Level, 8 2000-level, 3 3000-level, and 1 4000-level.
Proposed Distribution: 2 1000-level, 7 2000-level, 4 3000-level, and 4 4000-level.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
RE: Motion to modify the course number and description of PSY 1402 Social Psychology

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course number and description for PSY 1402: Social Psychology be modified as described below.

Description of the Proposed Modifications:

Current Course Number and Course Description:

PSY 1402: Social Psychology *(Cat I)*
Social psychology is concerned with how people think about, feel for, and act toward other people. Social psychologists study how people interact by focusing on the individual (not society as a whole) as the unit of analysis, by emphasizing the effect on the individual of the situation or circumstances in which behavior occurs, and by acquiring knowledge through empirical scientific investigation. This course will examine the cause of human behavior in a variety of domains of social life. Topics will include, but not be limited to, person perception, attitude formation and change, interpersonal attraction, stereotyping and prejudice, and small group behavior. Special attention will be given to applied topics: How can the research methods of social psychology be used to help solve social problems? Students will work together in small groups to explore in depth topics in social psychology of their own choosing. Suggested background: PSY 1400.

Proposed Course Number and Course Description:

PSY 2402: Social Psychology *(Cat I)*
This course is intended for all students from all backgrounds and at all experience levels. Social psychology is the scientific study of how people think, feel, and act toward other people in real or imagined social contexts. This course will examine human behavior in a variety of domains of social life. Topics will include, but not be limited to, person perception, attitude formation and change, conformity and obedience, helping others, interpersonal attraction, stereotyping and prejudice, and group behavior. Throughout the course, students develop a broad knowledge of the field, including core theoretical perspective, empirical research, and emerging trends. No previous experience with psychological science is necessary to take this course. Students may not receive credit for both PSY 1402 and PSY 2402.

Rationale:
Social Psychology is a 200 or 2000-level course at peer institutions because in Psychological Science 2000-level courses are survey courses that dive deeper into a specific topic/subfield within Psychology. Social Psychology is one of those subfields. At WPI, 2000-level PSY courses enroll at similar rates as 1000-level PSY courses; therefore, no significant enrollment changes are anticipated. Minor adjustments were made to the course description to reflect how the course is currently being taught.

Impact on Students: The revised course numbering should have minimal impact on students. It may initially cause some confusion if a student has taken the course at a previous level. This change will make the transfer of classes in and out of WPI easier. This will also help all students applying to graduate programs as the course numbering will better reflect the practices at peer institutions.

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
RE: Motion to modify the course number and description of PSY 1401 Cognitive Psychology

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course number and description for PSY 1401: Cognitive Psychology be modified as described below.

Description of the Proposed Modifications:

Current Course Number and Course Description:

PSY 1401: Cognitive Psychology *(Cat I)*
This course is concerned with understanding and explaining the mental processes and strategies underlying human behavior. The ways in which sensory input is transformed, reduced, elaborated, stored, and recovered will be examined in order to develop a picture of the human mind as an active processor of information. Topics will include perception, memory, problem-solving, judgment and decision making, human-computer interaction, and artificial intelligence. Special attention will be paid to defining the limitations of the human cognitive system. Students will undertake a project which employs one of the experimental techniques of cognitive psychology to collect and analyze data on a topic of their own choosing. Suggested background: PSY 1400.

Proposed Course Number and Course Description:

PSY 2403: Cognitive Psychology *(Cat I)*
This course is intended for anyone interested in learning about the mental processes and strategies underlying human behavior. The ways in which sensory input is transformed, reduced, elaborated, stored, and recovered will be examined in order to develop a picture of the human mind as an active processor of information. Topics will include perception, pattern recognition, attention, mental imagery, memory, categorization, problem solving, and decision making. Students will gain experience with research methods in cognitive psychology by participating in online experiments. Course assignments will emphasize applications of cognitive research to everyday life. No previous experience with psychological science is necessary to take this course. Students may not receive credit for both PSY 1401 and PSY 2403.

Rationale:
Cognitive Psychology is a 200 or 2000-level course at peer institutions because in Psychological Science 2000-level courses are survey courses that dive deeper into a specific topic/subfield within Psychology. Cognitive Psychology is one of those subfields. At WPI, 2000-level PSY courses enroll at similar rates as 1000-level PSY courses; therefore, no significant enrollment changes are anticipated. Minor adjustments were made to the course description to reflect how the course is currently being taught.

Impact on Students: The revised course numbering should have minimal impact on students. It may initially cause some confusion if a student has taken the course at a previous level. This change will make the transfer of classes in and out of WPI easier. This will also help all students applying to graduate programs as the course numbering will better reflect the practices at peer institutions.

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: **December 6, 2023**
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
RE: Motion to modify the course number and description of PSY 1404 Developmental Psychology

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course number and description for PSY 1404: Developmental Psychology be modified as described below.

Description of the Proposed Modifications:

Current Course Number and Course Description:

PSY 1404: Developmental Psychology *(Cat II)*
This course surveys human development from conception to death, with an emphasis on the scientific analysis of developmental patterns. The course will cover the biological, cognitive, emotional, social, personality, linguistic, and moral development of the individual at all stages. Students may not receive credit for PSY140X and PSY 1404. Recommended background: An introductory background in psychological science or experimental methods (PSY 1400).

Proposed Course Number and Course Description:

PSY 2404: Developmental Psychology *(Cat II)*
This course is for anyone with any experience level who is interested in understanding human development from conception to death. The course will cover development from biological, cognitive, emotional, social, personality, linguistic, and moral perspectives over the lifespan. No previous experience with psychological science is needed to take this course. Students may not receive credit for both PSY 1404 and PSY 2404.

Rationale:
Developmental Psychology is a 200 or 2000-level course at peer institutions because in Psychological Science 2000-level courses are survey courses that dive deeper into a specific topic/subfield within Psychology. Developmental Psychology is one of those subfields. At WPI, 2000-level PSY courses enroll at similar rates as 1000-level PSY courses; therefore, no significant enrollment changes are anticipated.

Impact on Students: The revised course numbering should have minimal impact on students. It may initially cause some confusion if a student has taken the course at a previous level. This change will make the transfer of classes in and out of WPI easier. This will also help all students applying to graduate programs as the course numbering will better reflect the practices at peer institutions.

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
RE: Motion to modify the course number and description of PSY 1412 Mental Health

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course number and description for PSY 1412: Mental Health be modified as described below.

Description of the Proposed Modifications:

Current Course Number and Course Description:

PSY 1412: Mental Health *(Cat II)*
This course will introduce the wide variety of psychological disorders that exist in society (personality, anxiety, mood, psychotic, etc.). For each disorder discussed, possible causes, symptoms, preventions, and treatments will be examined. The course will cover psychopathologies throughout the entire spectrum of the lifespan (infancy to adulthood). Empirical research on understanding, diagnosing, and treating the different disorders will be emphasized. Suggested background: Introductory psychology (PSY 1400 or equivalent). Students may not receive credit for both PSY 1412 and PSY 141X.

Proposed Course Number and Course Description:

PSY 2412: Mental Health *(Cat II)*
This course is intended for anyone from any background who is interested in learning about mental health. This course will introduce mental health more broadly, including topics such as well-being, stress, anxiety, etc. In addition, we will discuss what makes something a disorder and the wide variety of psychological disorders that exist in society (personality, anxiety, mood, psychotic, etc.). Possible causes, symptoms, preventions, and treatments will be examined. Empirical research on mental health will be emphasized. No previous experience with psychological science is needed to take this course. Students may not receive credit for both PSY 1412 and PSY 2412.

Rationale:
Mental Health is a 200 or 2000-level course at peer institutions because in Psychological Science 2000-level courses are survey courses that dive deeper into a specific topic/subfield within Psychology. Mental Health is one of those subfields. At WPI, 2000-level PSY courses enroll at similar rates as 1000-level PSY courses; therefore, no significant enrollment changes are anticipated.

Impact on Students: The revised course numbering should have minimal impact on students. It may initially cause some confusion if a student has taken the course at a previous level. This change will make the transfer of classes in and out of WPI easier. This will also help all students applying to graduate programs as the course numbering will better reflect the practices at peer institutions.

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: **December 6, 2023**
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
RE: Motion to modify the course number and description of PSY 2407 Psychology of Gender

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course number and description for PSY 2407: Psychology of Gender be modified as described below.

Description of the Proposed Modifications:

Current Course Number and Course Description:

PSY 2407: Psychology of Gender *(Cat II)*
This course will provide an overview of the psychological study of gender and will utilize psychological research and theory to examine the influence of gender on the lives of men and women. This course will examine questions such as: What does it mean to be male or female in our society and other societies? How do our constructs of gender develop over our life span? How does our social world (e.g., culture, religion, media) play a role in our construction of gender? And What are the psychological and behavioral differences and similarities between men and women? Recommended background: PSY 1400 or PSY 1402. This course will be offered in 2021-22, and in alternating years thereafter.

Proposed Course Number and Course Description:

PSY 3407: Psychology of Gender ***(Cat II)***
This course is intended for students interested in learning about gender and psychology. The course will provide an overview of research and theory in the field. We will examine the myths and stereotypes associated with gender in our society, the social and psychological gender similarities and differences that have been identified in research, and consider gender with an intersectional lens (e.g., considering different identities). We will also examine longstanding and contemporary issues pertaining to the psychology of gender. Students may not receive credit for both PSY 2407 and PSY 3407. This course will be offered in 2025-26, and in alternating years thereafter.
Recommended background: Introduction to Psychological Science (PSY 1400) or Social Psychology (PSY 2402).

Rationale:
Psychology of Gender is a 200 or 2000-level or a 300 or 3000-level course at peer institutions. In Psychological Science Programs at Peer institutions, 3000-level courses tend to be more discussion-based courses that explore a topic within (or across) a subfield—especially emerging, developing, and evolving fields. Psychology of Gender is one of those subfields that is evolving with the conceptualization of Gender Identity going beyond a binary (e.g., Male and Female). Likewise, this course works very well as a discussion-based course.

Impact on Students: The revised course numbering should have minimal impact on students. This course historically draws enrollments between 20-50 students. While the 3000-level may deter some students from enrolling, some students will be just as likely to enroll because this course is part of the Gender, Sexuality, and Women's Studies program. In addition, given the sensitive nature of the content and course discussions, somewhat smaller enrollments may benefit students more.

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
RE: Motion to modify the course number, description, and category level of PSY 2408 Health Psychology

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course number and description for PSY 2408: Health Psychology be modified as described below.

Description of the Proposed Modifications:

Current Course Number and Course Description:

PSY 2408: Health Psychology *(Cat II)*
In health psychology, we will review global and domestic health-related problems to discuss the links between health and psychology and discuss potential interventions. Health psychology is interdisciplinary in nature and relevant to students interested in health-related topics whether from a psychological, biological, biomedical, global, or preventative measures. Major health problems will be discussed: for example, AIDS is the number one cause of death worldwide; obesity (in children and adults) is a growing epidemic; the aging U.S. population will cause unprecedented health needs. Finally, stress infiltrates chronic health outcomes such as cancer, diabetes, and cardiovascular disease. We will also review what 'positive health' means including nutrition, exercise, social support, managing stress, and habits for maintaining good health. Students will engage in research-based learning when considering psychological, cultural, and biological interventions for real world health crises. Recommended background: Introduction to Psychological Science (PSY 1400) and/or Social Psychology (PSY 1402).

Proposed Course Number and Course Description:

PSY 3408: Health Psychology *(Cat I)*
This course is intended for students interested in learning about health and will be useful for students pursuing psychology, biology, healthcare, biomedical engineering, etc. Health Psychology is an interdisciplinary field that examines the complex relationship between psychology and physical health. Health psychologists study how psychology contributes to the promotion and maintenance of health, the prevention and treatment of illness, and the evaluation and improvement of the healthcare system. This course takes a deep dive into the scientific research on how various psychosocial factors are implicated in health, wellness, and illness. Topics covered in this course include: stress, health behavior change, health communications, psychoneuroimmunology, health disparities, patient-provider relationships, social support, coping, aging, and more. We will explore pressing questions such as: What does stress do to your health? What psychological and social factors lead people to behave in healthy or unhealthy ways? What drives racial, ethnic, or gender differences in health? Does it matter how your doctor talks to you? Can a sugar pill help back pain? En route to answering these questions, students will curate their knowledge in foundational Health Psychology theory and the core biopsychosocial constructs in the field. They will integrate these constructs to analyze and understand drivers of health, wellness, and illness in themselves and the world. No prior experience with psychology is needed to take this course. Students may not receive credit for both PSY 2408 and PSY 3408.
Recommended background: Introduction to Psychological Science (PSY 1400) and/or Social Psychology (PSY 2402).

Rationale:
Health Psychology is a 200 or 2000-level or a 300 or 3000-level course at peer institutions. In Psychological Science Programs at Peer institutions, 3000-level courses tend to be more discussion-based courses that

explore a topic within (or across) a subfield—especially emerging, developing, and evolving fields. Health Psychology is constantly developing, evolving, and has emerging trends. Likewise, this course works very well as a discussion-based course. This course has been taught every year for the past 4 years to enrollments of 30+ students. Since it is already being taught on a Cat. I basis, we propose to make that designation official to assist students in planning their schedules. Minor adjustments were made to the course description to reflect how the course is currently being taught.

Impact on Students: We anticipate minimal impacts on students. This course historically draws enrollments between 30-50 students. While the 3000-level may deter some students from enrolling, some students will be as likely to enroll because this course is recommended for pre-health students and the Global Public Health minor. The majority of psychology majors have a biopsychology orientation and take this course. Given the sensitive nature of the content and course discussions, somewhat smaller enrollments may benefit students.

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
RE: Motion to modify the course number and description of PSY 2504 Human Sexuality

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course number and description for PSY 2504: Human Sexuality be modified as described below.

Description of the Proposed Modifications:

Current Course Number and Course Description:

PSY 2504: Human Sexuality
Cat II
Do women have less sexual arousal than men? How do religion, laws, and public policies influence perceptions of sex? What effects does pornography have on sexual attitudes and behaviors? How widespread is sexual and domestic violence? In this class, we will explore questions relating to our sexuality. Human sexuality is the study of the biological, evolutionary, social, cultural, and political perspectives relating to sex and the meaning behind "masculinity", "femininity", and "asexual" or "genderqueer". We will discuss topics such as: gender roles, transgender, sexual orientation, the anatomy and physiology of the act of sex, relationships, sexual aggression, pornography, contraception, pregnancy, abortion, sexuality and aging, and the role of religion, law, policies, and cultural. We will think about how our sexuality influences how we think and act in the world around us. We will examine sexuality within the United States and throughout the world. This course is designed to increase awareness and sensitivity to sexuality and issues relating to it. Discussions in class will be candid and on sensitive and controversial topics. Recommended background: Introduction to Psychological Science (PSY 1400), Social Psychology (PSY 1402), and/or Psychology of Gender (PSY 2407).

Proposed Course Number and Course Description:

PSY 3504: Human Sexuality *(Cat II)*
How do religion, laws, and public policies influence perceptions of sex? What effects does pornography have on sexual attitudes and behaviors? How widespread is sexual and domestic violence? In this class, we will explore questions relating to sexuality. Human sexuality is the study of the biological, evolutionary, social, cultural, and political perspectives relating to sex, sexual orientation, and gender identity. We will discuss topics such as: gender identity, sexual orientation, anatomy and physiology of the act of sex, relationships, sexual aggression, pornography, contraception, pregnancy, abortion, sexuality over the lifespan, and the role of religion, law, policies, and culture on sexuality. We will think about how sexuality influences how we think and act in the world around us. We will examine sexuality within the United States and throughout the world. This course is designed to increase awareness and sensitivity to sexuality and issues relating to it. Discussions in class will be candid and on sensitive and controversial topics. No prior experience with psychology is needed to take this course, just an open mind. Students may not receive credit for both PSY 2504 and PSY 3504. This course will be offered in 2024-25, and in alternating years thereafter.
Recommended background: Introduction to Psychological Science (PSY 1400), Social Psychology (PSY 2402), and/or Psychology of Gender (PSY 3407).

Rationale:
Human Sexuality is a 200 or 2000-level or a 400 or 4000-level course at peer institutions. In Psychological Science Programs at Peer institutions, 3000-level courses tend to be more discussion-based courses that explore a topic within (or across) a subfield—especially emerging, developing, and evolving fields. Human

Sexuality is evolving with the conceptualization of gender identity beyond a binary, sexual orientation being fluid, and changes in laws relating to sexuality (e.g., same sex marriage, reproductive technologies, abortion, etc.) Likewise, this course works very well as a discussion-based course.

Impact on Students: The revised course numbering should have minimal impact on students. This course historically draws enrollments between 15-40 students. While the 3000-level may deter some students from enrolling, some students will be just as likely to enroll because this course is part of the Gender, Sexuality, and Women's Studies program. In addition, given the sensitive nature of the content and course discussions, somewhat smaller enrollments may benefit students more.

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
RE: Motion to modify the course number and description of PSY 2410 School Psychology

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course number and description for PSY 2410: School Psychology be modified as described below.

Description of the Proposed Modifications:

Current Course Number and Course Description:

PSY 2410: School Psychology *(Cat II)*
School psychology focuses on understanding children and adolescents' mental health, behavioral health and learning needs in order to work with educators and parents to help students succeed academically and socially. This course will provide an overview of the field of school psychology, drawing from educational, developmental, and cognitive research. Students will critically examine the theoretical, methodological, and practical approaches to understanding how in and out of school interventions and contexts influence the academic, social, and emotional development of children. Topics will include school readiness and transitions, behavioral and self-regulatory skills, socio-cultural diversity and skill gaps, assessment tools and classification, teacher-child interactions, and school- based interventions that promote positive development. This course differs from PSY 2401: They Psychology of Education in that it focuses on school systems rather than education more broadly. Students planning IQPs in educational settings will find this course particularly useful. Recommended background: Introduction to Psychological Science (PSY 1400), Cognitive Psychology (PSY 1401), and/or The Psychology of Education (PSY 2401), or an approved equivalent.

Proposed Course Number and Course Description:

PSY 4100: School Psychology *(Cat II)*
This course is intended for psychology majors and minors, and those interested in upper-level discussions on education and schools. School psychology focuses on understanding children and adolescents' mental health, behavioral health and learning needs to work with educators and parents to help students succeed academically and socially. School psychology draws from educational, developmental, and cognitive research. Students will critically examine the theoretical, methodological, and practical approaches to understanding how in and out of school interventions and contexts influence the academic, social, and emotional development of children. Topics may include: school readiness and transitions, behavioral and self-regulatory skills, socio-cultural diversity and skill gaps, assessment tools and classification, teacher-child interactions, and school- based interventions that promote positive development. This course differs from PSY 2401: Psychology of Education as it focuses on school systems rather than education more broadly. Students cannot earn credit for both PSY 2410 and PSY 4100. This course will be offered in 2025-26, and in alternating years thereafter.
Recommended background: Introduction to Psychological Science (PSY 1400), Cognitive Psychology (PSY 1401), and The Psychology of Education (PSY 2401) or an approved equivalent.

Rationale:
There has been an increase in majors and minors in the psychological science undergraduate program and more interest in B.S./M.S. options. Therefore, we are seeking to expand our offerings to include more advanced topical courses. PSY 4100 will accomplish these goals. This course will now focus on higher level topics and empirical research. In Psychological Science, 4000-level courses tend to be higher-level

discussion-oriented courses that focus on a very specific topic and are intended to get students ready for graduate level course work. This course fits that objective.

Impact on Students: The revised course numbering should have minimal impact on students. It may initially decrease enrollment, but it is still a recommended course for the Teacher Prep program and may now attract B.S./M.S. and LST students.

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
RE: Motion to modify the course number and description of PSY 3400 Survey Design and Methodology

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course number and description for PSY 3400: Survey Design and Methodology be modified as described below.

Description of the Proposed Modifications:

Current Course Number and Course Description:

PSY 3400: Survey Design and Methodology *(Cat II)*
Surveys are everywhere. But good surveys based on sound social science are rare. Conducting a successful survey requires familiarity with the methods and techniques developed by psychologists and other social scientists through long experience to ensure the accuracy, reliability, and validity of survey data. This course will focus on the common mistakes of first time survey researchers and ways to avoid them. Topics covered will include alternatives to survey research, sampling, response rates, questionnaire design and implementation, question wording, pretesting, ethical issues in survey research, and communicating survey results. Special attention will be given to issues related to the use of on-line survey platforms. During the course students will be guided through the development, implementation, and analysis of a survey on a topic of their own choosing. This course is an appropriate methodology course for psychology and other social science majors and can also be taken by students of all majors as preparation for a survey-based IQP or MQP. Recommended background: background in psychological science such as social or cognitive. Students who completed PSY340X cannot receive credit for PSY3400. This course will be offered in 2021-22, and in alternating years thereafter.

Proposed Course Number and Course Description:

PSY 4400: Survey Design and Methodology *(Cat II)*
This course is designed for psychology majors and minors and other students interested in learning how to conduct scientific survey research. The course will focus on the common mistakes of first-time survey researchers and strategies to avoid them. Topics covered will include alternatives to survey research, sampling, response rates, questionnaire design and implementation, question wording, pretesting, ethical issues in survey research, and communicating survey results. Special attention will be given to the effective use of on-line survey platforms. During the course students will be guided through the development, implementation, and analysis of a survey on a topic of their own choosing. Students cannot receive credit for both PSY3400 and PSY 4400. This course will be offered in 2024-25, and in alternating years thereafter. Recommended background: PSY 2402: Social Psychology, PSY2403: Cognitive Psychology, and applied statistics (MA 2610 or MA 2611).

Rationale:
In Psychological Science undergraduate programs, 4000-level courses tend to be related to research methodology or data analysis, or are higher-level discussion-oriented courses that focus on a very specific topic and are intended to overlap or get students ready for graduate-level course work. In our review of peer institutions, we found that research methodology and statistics courses were offered throughout the curriculum at the 200/2000, 300/3000, and 400/4000 level. The rationale for lower numbering was to get students engaged in these courses earlier in their time of study. The rationale for higher numbering was if the courses focused on engaging students in the research itself (e.g., research projects) and preparing students for senior thesis or graduate work. We have seen success at the 3000-level for this course at WPI

with increasing enrollments (most recently 20 students). This course involves students creating a survey and testing this survey. Likewise, it is meant to prepare them for their project work, including graduate study. By moving this course to a 4000-level it will allow more opportunities for students in B.S./M.S. programs to engage in important methodology-based project-based courses.

Impact on Students: The revised course numbering should have minimal impact on students. At the 3000-level, this course has been increasing in enrollment. Given that this course will now better sync with B.S./M.S. programs, we do not anticipate significant dips in enrollment. In addition, given the intensive project-based nature of this course an enrollment of approximately 20 students is ideal.

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
RE: Motion to modify the course number and description of PSY 3500 Experimental Design and Analysis

Motion: On behalf of the Psychological and Cognitive Sciences Program, the Committee on Academic Operations recommends and I move that the course number and description for PSY 3500: Experimental Design and Analysis be modified as described below.

Description of the Proposed Modifications:

Current Course Number and Course Description:

PSY 3500: Experimental Design and Analysis *(Cat II)*
In this course, students will learn about different processes used when designing experiments. In addition, they will learn about different analyses that can be used based on different experimental designs. Students will design and run a simple experiment in the course. In addition, students will analyze the data and present their findings. Topics covered in the course include experimental design, experimental methods, ethical issues related to human participants research, use of statistical analyses and programs to analyze data, and hypothesis testing. Recommended background: Familiarity with the fundamentals of psychological science and cognitive or social psychology (PSY 1400 and PSY 1401 or PSY 1402, or equivalent). Students may not receive credit for both SS2400 and PSY 3500. This course will be offered in 2015-16, and in alternating years thereafter.

Proposed Course Number and Course Description:

PSY 4500: Experimental Design and Analysis *(Cat II)*
This course is designed for psychology majors and minors or students interested in learning about experimental design and analysis in psychological research. This course will explore different processes used when designing experiments. In addition, this course will cover different analyses that can be used based on different experimental designs. Students will design and run experiments in the course. In addition, students will analyze the data and present their findings. Topics covered in the course include experimental design, experimental methods, ethical issues related to human participants research, use of statistical analyses and programs to analyze data, and hypothesis testing. Students may not receive credit for both PSY 3500 and PSY 4500. This course will be offered in 2025-26, and in alternating years thereafter.
Recommended background: PSY 2402: Social Psychology, PSY2403: Cognitive Psychology, and applied statistics (MA 2610 or MA 2611).

Rationale:
In Psychological Science undergraduate programs, 4000-level courses tend to be related to research methodology or data analysis, or are higher-level discussion-oriented courses that focus on a very specific topic and are intended to overlap or get students ready for graduate-level course work. In our review of peer institutions, we found that research methodology and statistics courses were offered throughout the curriculum at the 200/2000, 300/3000, and 400/4000 level. The rationale for lower numbering was to get students engaged in these courses earlier in their time of study. The rationale for higher numbering was if the courses focused on engaging students in the research itself (e.g., research projects) and preparing students for senior thesis or graduate work. We have seen success at the 3000-level for this course at WPI with increasing enrollments (most recently 18 students). This course involves students in developing an experiment, running the experiment, analyzing the data, and presenting that data in a manuscript, oral and poster presentation. Likewise, it is meant to prepare them for their MQP and any graduate work. Moving

this course to the 4000 level will provide more incentive for students in B.S./M.S. programs to engage in experimental design courses.

Impact on Students: The revised course numbering should have minimal impact on students. This course is required for Psychological Science majors and recommended for Psychology minors. At the 3000-level, this course has been increasing in enrollment. In addition, given the intensive research project-based nature of this course enrollments below 20 are ideal.

Resources Needed: None

Implementation Date: 2024-2025 Academic Year

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course description of MA 2621 Probability for Applications

Motion: On behalf of the Department of Mathematical Sciences, the Committee on Academic Operations recommends and I move that the course description of MA 2621 Probability for Applications be modified as described below.

Description of the Proposed Changes:
(The yellow highlighted text in the current course description is to be replaced by the yellow highlighted text in the proposed course description.)

Current Course description (from 2022-23 Undergraduate Catalog)**:**

MA 2621: Probability for Applications *(Cat I, 1/3 Units)*
This course is designed to introduce the student to probability. Topics to be covered are: basic probability theory including Bayes theorem; discrete and continuous random variables; special distributions including the Bernoulli, Binomial, Geometric, Poisson, Uniform, Normal, Exponential, Chi-square, Gamma, Weibull, and Beta distributions; multivariate distributions; conditional and marginal distributions; independence; expectation; transformations of univariate random variables.
Recommended Background: MA 1024.

Proposed Course Description:

MA 2621: Probability for Applications *(Cat I, 1/3 Units)*
This course is an application-oriented course, primarily designed for non-Mathematical Sciences majors, and introduces the student to applied probability. Topics to be covered are: basic probability theory including Bayes theorem; discrete and continuous random variables; special distributions including the Bernoulli, Binomial, Geometric, Poisson, Uniform, Normal, Exponential, Chi-square, Gamma, Weibull, and Beta distributions; multivariate distributions; conditional and marginal distributions; independence; expectation; transformations of univariate random variables. Credit may not be earned both for this course and for MA 2631 Probability Theory.
Recommended Background: MA 1024.

Rationale:
The proposed update is a minor change to the course description, which clarifies that the course is designed for non-Mathematical Sciences majors. Otherwise, the contents, instructions, and scheduling of the course will all remain unchanged, making it unnecessary to replace it with a new course.

Impact on students: Students will have a better understanding of the course descriptions, which will help them select courses that suit them best.

Resource Requirements: No resource impact

Implementation Date: AY 2024-2025

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to modify the course description of MA 2631 Probability Theory

Motion: On behalf of the Department of Mathematical Sciences, the Undergraduate Committee recommends and I move that the course description of MA 2631 Probability Theory be modified as described below.

Description of the Proposed Changes:
(The yellow highlighted text in the current course description is to be replaced by the yellow highlighted text in the proposed course description.)

Current Course Description (from 2022-23 Undergraduate Catalog)**:**

MA 2631. Probability Theory *(Cat I, 1/3 Units)*
The purpose of this course is twofold: • To introduce fundamental ideas and methods of mathematics using the study of probability as the vehicle. These ideas and methods may include systematic theorem-proof development starting with basic axioms; mathematical induction; set theory; applications of univariate and multivariate calculus. • To introduce the student to probability. Topics to be covered will be chosen from: axiomatic development of probability; independence; Bayes theorem; discrete and continuous random variables; expectation; special distributions including the binomial and normal; moment generating functions; multi-variate distributions; conditional and marginal distributions; independence of random variables; transformations of random variables; limit theorems. This course is designed primarily for Mathematical Sciences majors and those interested in the deeper mathematical issues underlying probability theory. A more applications-oriented course with similar content is MA 2621 Probability for Applications which is primarily designed for students in departments other than Mathematical Sciences. Undergraduate credit may not be earned both for this course and for MA 2621 Probability for Applications.
Recommended Background: Multivariable Differential and Integral Calculus (MA 1024, or equivalent).

Proposed Course Description:

MA 2631. Probability Theory *(Cat I, 1/3 Units)*
This course is designed primarily for Mathematical Sciences majors and those interested in the deeper mathematical issues underlying probability theory. The purpose of this course is twofold: (1) To introduce fundamental ideas and methods of mathematics using the study of probability as the vehicle. These ideas and methods will include systematic theorem-proof development starting with basic axioms; mathematical induction; set theory; applications of univariate and multivariate calculus. (2) To introduce the student to probability. Topics to be covered will be chosen from: axiomatic development of probability; independence; Bayes theorem; discrete and continuous random variables; expectation; special distributions including the binomial and normal; moment generating functions; multivariate distributions; conditional and marginal distributions; independence of random variables; transformations of random variables; limit theorems. A more applications-oriented course with similar content is MA 2621 Probability for Applications which is primarily designed for students in departments other than Mathematical Sciences. Credit may not be earned both for this course and for MA 2621.
Recommended Background: Multivariable Differential and Integral Calculus (MA 1024, or equivalent).

Rationale:
One issue is that CS majors are required to take at least 1/3 unit of probability (MA 2621 or MA 2631). For many of these students, MA 2621 may be more appropriate, and this updated course description

hopes to reflect that. The CS majors do take the course MA 2201/CS 2022, but there seem to still be gaps in their knowledge of proofs, given how much some CS majors struggle in MA 2631.

The contents, instructions, and scheduling of the course will all remain unchanged, making it unnecessary to replace it with a new course.

Impact on students: Students will have a better understanding of the course descriptions, which will help them select courses that suit them best.

Resource Requirements: No resource impact

Implementation Date: AY 2024-2025

Date: December 6, 2023
To: WPI Faculty
From: Committee on Academic Operations (Prof. Van Dessel, Chair)
Re: Motion to add CN 3571 Contemporary China: Culture and Trends

Motion: On behalf of the Humanities and Arts Department, the Committee on Academic Operations recommends and I move that CN 3571 China: Culture and Trends, as described below, be added.

Proposed Course Description:

CN 3571 Contemporary China: Culture and Trends *(Cat II)*
This advanced language course aims to develop students' in-depth understanding and perspectives on social-cultural issues in contemporary Greater China. Building upon the foundation of CN3543 Advanced Chinese III, this course continues to advance students' language skills through the exploration of topics that reflect the transitional changes of traditional Chinese cultural values due to the influence of Western culture and the impact of globalization. Students will learn essential vocabulary to understand, discuss, analyze, and examine the unique cultural phenomena associated with the selected topics through comparison with their own culture. Students who have completed CN 357X cannot receive credit for CN 3571.
Recommended Background: This course is designed for CFL (Chinese as a Foreign Language) and CHL (Chinese as a Heritage) students who have completed the prerequisite of CN3543 or equivalent.

Anticipated Instructor: Wen-Hua Du, Huili Zheng or Hsinhan Hung as a capable alternate.

Expected enrollment: The course will be capped at 18 students. Anticipated initial enrollment is 10-12 students, with the expectation that enrollment will increase as the Chinese language enrollment grows.

Preferred term: C-term

Course type: Lecture/discussion

Rationale:
The demand for more advanced Chinese language courses is growing at WPI. We have seen an increasing number of incoming students being placed into higher-level language courses since 2015. More than 66 students were placed into the fifth sequence or advanced-level Chinese language course, with eight out of 15 students in AY22-23 alone. We expect this trend to continue. Among these advanced beginners, there is a growing Chinese as a Heritage Learners (CHLs) who want to continue learning the language and will require more advanced courses to allow them to further their language study. In addition, WPI's four IQP Project Centers and one MQP center in the greater China area have motivated Chinese language students to continue their study of the Chinese language beyond the six courses required to complete the HUA Requirement. The Chinese Studies Minor has steadily attracted 54 students since its launch in 2015. With China becoming increasingly important strategically in relation to the global community, offering more advanced Chinese language courses provides our students with a way to engage with the Chinese speaking world while on campus.

Intended audience: Students pursuing HUA breadth or depth requirement in Chinese language or Chinese studies; students pursuing Chinese Studies minor; students interested in Hangzhou, Beijing, Taiwan, or Hong Kong project centers; students pursuing minor or major in International and Global Studies. This course can serve as the capstone for the HUA Requirement for those in the Chinese language track.

Resource Needs: No additional resources necessary. Once permanent, the course will become part of Prof. Wen-Hua Du's regular teaching load and the course will be offered every other year (Category II). Any standard classroom with technology equipment on campus will serve the purposes of this course.

Impact on Distribution Requirements:
The course will accommodate students who enter WPI and placed into advanced language sequence and who want to fulfill the HUA Requirement through the study of Chinese. In addition, the courses will enable students to attain a higher level of proficiency for project work in China, as well as post-graduate work in the Chinese speaking areas. The course will contribute to the development of global competency and a global mindset for enrolled students. More specifically:

- The proposed course can serve as the inquiry practicum for students choosing to fulfill their HUA Requirement through the Chinese language track;
- Students can combine language classes with 2000- or 3000-level Chinese history, philosophy, or culture classes and a China-related inquiry seminar related to China (e.g., Inquiry Seminar in Asian History, Urban History, Business in the Post-Socialist State, Comparative History, or Rhetorical Communication) to complete their HUA Requirement with a thematic focus on China, or they can combine two Chinese language courses taken as breadth with depth courses from any other HUA discipline (with the exception of other languages) and an inquiry seminar/practicum in the selected depth discipline to complete their HUA Requirement;
- The proposed course can count toward the Chinese Studies Minor.

Implementation Date: The anticipated implementation date for the courses is C-2025, with it being offered in alternate years thereafter.

Contact: Contact: Esther Boucher-Yip, Assoc Department Head (Languages, Literature, Writing)

Appendix: Summary of Previous Offerings:
This experimental course CN357X: *Contemporary China: Culture and Trends* was first offered in C-term 2020 with the enrollment of 8 students. The course was offered again in 2022 with 9 students enrolled. There are 14 students enrolled for the offering in C-term 2024. This is the second content-based language course offered by the Chinese language section, with the first being CN3561 *Business Chinese*.

CN3561 was first offered with 3 enrolled students as an experimental course in 2018 with the support of the UISFL grant (Undergraduate International Studies and Foreign Language Program). The enrollment of CN3561 increased to 7 students when it was offered in 2019, and in 2022, it had 17 enrollments. *Business Chinese* became a permanent Category II course offering in 2020.

In response to the growing demand for more advanced Chinese courses among students, and considering the success of CN 3561 *Business Chinese*, we request the addition of CN357X (please see the **Assessment section** below) to our curriculum commencing in AY 2023-2024 and to be offered in alternate years thereafter.

Assessment:
Student feedback was gathered by using WPI's course evaluation, with particular attention on questions 1, 2, 3, 7 and 8. The result indicates students' overall satisfaction for the course and the instructor. Detailed breakdown of the evaluation as follows:

	2020 (n=5)	2022 (n=7)
Q1: My overall rating of this course	4.6	5
Q2: My overall rating of the instructor	4.8	5
Q3: The educational value of the assigned work	4.8	5
Q7: The amount I learned from the course	4.2	4.6
Q8: The intellectual challenge by this course	4.8	4.1

Qualitative feedback from the 2020 course evaluation:

- I enjoyed learning Chinese within the context of Chinese cultural topics.
- The topics are very interesting and insightful. I felt like that helped keep me engaged in learning the new material.

Qualitative feedback from the 2022 course evaluation:

- I liked the academic challenge this class presented. The selected material was a good. progression from Business Chinese which is the previous class I took.
- I liked the engagement in the class.
- I thoroughly enjoyed the conversation format of this class.
- I thought that the subject matter of this Chinese class made it much. More enjoyable for me. I liked the Chinese history and culture blended into the language course.
- I wish there was more time to have discussion in class. I feel 50 minutes is not enough time to learn new words and practice in class.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to modify the title of CS 534 from "Artificial Intelligence" to "Introduction to Artificial Intelligence"

Motion: On behalf of the Computer Science Department, the Committee on Graduate Studies and Research recommends and I move that the title of CS 534 be modified from "Artificial Intelligence" to the "Introduction to Artificial Intelligence"

Description of the Proposed Modification:
The current title and description of the course (in the 2023-24 Graduate Catalog) is:

CS 534: Artificial Intelligence *(3 credits)*
This course gives a broad urvey of artificial intelligence. The course will cover methods from search, probabilistic reasoning, and learning, among other topics. Selected topics involving the applications of these tools are investigated. Such topics might include natural language understanding, scene understanding, game playing, and planning.
Prerequisites familiarity with data structures and a high-level programming language

The course description will be unchanged and the proposed new title of the course is:

CS 534: Introduction to Artificial Intelligence

Rationale:
This course provides an overview of many topics related to AI. This change in title aims to reflect the fact that over the years, additional advanced courses on AI have been created, and will continue to be created. This updated course title would now reflect that it is an introductory course.

Resource Needs: This requires no changes in resources.

Implementation Date: The change would take place in the 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, chair)
Re: Motion to add CS 551 Reinforcement Learning to be cross-listed with DS 551

Motion: On behalf of the Department of Computer Science and the Data Science Program, the Committee on Graduate Studies and Research recommends and I move that CS 551 Reinforcement Learning be added as a cross-listed graduate course with the current course existing DS 551, as described below.

Proposed Cross-Listing and Current Course Description:

CS 551/DS 551 Reinforcement Learning *(3 credits)*
Reinforcement Learning (RL) is an area of machine learning concerned with how agents take actions in an environment with a goal of maximizing some notion of "cumulative reward". The problem, due to its generality, is studied in many disciplines, and applied in many domains, including robotics and industrial automation, marketing, education and training, health and medicine, text, speech, dialog systems, finance, among many others. In this course, we will cover topics including: Markov decision processes, reinforcement learning algorithms, value function approximation, actor-critics, policy gradient methods, representations for reinforcement learning (including deep learning), and inverse reinforcement learning. The course project(s) will require the implementation and application of many of the algorithms discussed in class.
Prerequisites: Machine Learning (CS 539), statistical learning at the level of DS 502/MA 543, and programming skills at the level of CS 5007.

Rationale:
This course was originally introduced as a special topics course that was cross- listed between CS and DS. The special topics course was formalized into a regular course (DS 551) in Spring'23, but the cross-listing was inadvertently left out. This course is taught by faculty who are members of both the CS Department and DS Program. This motion simply cleans up the omission when the DS 551 course was created.

Impact on Degree Requirements: It will be offered in the Computer Science graduate program's "AI" breadth bin. The course will be offered as an elective course in the Data Science program.

Resources Needed: No new resources are required as the course has already run as a cross-listed special topics course and will now be a permanent cross-listed course.

Anticipated Instructors: Anticipated instructors are Yanhua Li and Xiangnan Kong.

Implementation Date: The implementation date for this action is the 2024-25 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add CS552/DS552: Generative Artificial Intelligence

Motion: On behalf of the Computer Science Department and the Data Science Program, the Committee on Graduate Studies and Research recommends and I move that CS552/DS552: Generative Artificial Intelligence, as described below, be added.

Proposed Course Description:

CS 552 / DS552. Generative Artificial Intelligence (*3 credits*)
Generative Artificial Intelligence (Gen-AI) is a class of machine learning models that generate new data (text, images, faces, voice, artwork) that is near indistinguishable from the equivalent real data typically generated by humans. These models are trained based on realistic example data sets from the real world. This course covers the underlying fundamentals of generative models. It also introduces the design and modeling of some of the modern generative models: Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs), Diffusion models, ChatGPT, Large Language Models, to name a few. Several applications will be discussed, ranging from image generation for engineering or science applications to the utilization of generated data for data augmentation in AI systems. Ethical concerns related to the danger of these generative technologies concerning issues from misinformation, bias, to data ownership are reviewed.
Recommended Background: Core artificial intelligence classes, such as machine learning and deep learning, or equivalent background is highly recommended.

Anticipated Instructor: The course can be taught by any of the current Computer Science or Data Science faculty with expertise in AI or by the new faculty requested to support the MS in AI program. Examples of faculty that could teach this course include Prof. Oren Mangoubi, Prof. Jake Whitehill, Prof. Yanhua Li, Prof. Xiaozhou Liu, and others.

Rationale:
This course will be offered as an elective course in both the Data Science and the Computer Science graduate programs. In addition, this class will be used in the new Master of Science in Artificial Intelligence programs.

Resources Needed: This course can be taught in any standard classroom. The course does not require specific facilities. This course will require students to have access to the WPI computing cluster, including GPU machines.

Impact on Distribution Requirements and Other Courses: This course does not replace any existing courses. It will have minimal impact on existing programs and their distribution requirements.

Implementation Date: The course would be added in the 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add CS553/DS553: Machine Learning Development and Operations

Motion: On behalf of the Computer Science Department and the Data Science Program, the Committee on Graduate Studies and Research recommends and I move that CS553/DS553: Machine Learning Development and Operations, as described below, be added to the graduate catalog.

Proposed Course Description:
CS 553 / DS 553: Machine Learning Development and Operations (MLOps) (*3 credits*)
This course teaches students the computational skills required in the fields of Artificial Intelligence (AI) and Data Science. As data-driven decision-making and AI applications continue to transform industries, proficiency in programming and machine learning tools is important. In this course, you will develop a strong foundation in programming languages commonly used in AI and Data Science (such as Python). This course will cover the development, debugging, deployment, and subsequent monitoring phases of models in end-to-end pipelines core to machine learning systems. You will also familiarize yourself with popular libraries, frameworks and debugging on IDEs, such as PyCharm, PyTorch, scikit-learn, and/or pandas. Possible topics may include practice code development with a copilot as well as deployment of models on a cloud computing environment The student will engage in hands-on projects to practice their programming skills to solve real-world AI and Data Science problems.
Recommended Background: Basic understanding of programming concepts, and preferably some python knowledge.

Anticipated Instructor: The course can be taught by any of the current Computer Science or Data Science faculty members with expertise in Machine Learning or by the new faculty requested to support the MS in AI program. In particular, faculty members who may teach this course include Prof. Randy Paffenroth, Prof. Yanhua Li, and Prof. Kyumin Lee.

Rationale:
This course will be offered as an elective course in both the Data Science and the Computer Science graduate programs. In addition, this class will be used in the new Master of Science in Artificial Intelligence programs.

Resources Needed: This course can be taught in any standard classroom. The course does not require specific facilities. This course will require students to have access to the WPI computing cluster, including GPU machines.

Impact on Distribution Requirements and Other Courses: This course does not replace any existing courses. It will have minimal impact on existing programs and their distribution requirements.

Implementation Date: The course would be added in the 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add CS554/DS554: Natural Language Processing

Motion: On behalf of the Computer Science Department and the Data Science Program, the Committee on Graduate Studies and Research recommends and I move that a new course, CS554/DS554: Natural Language Processing, as described below, be added to the graduate catalog.

Proposed Course Description:

CS 554 / DS 554: Natural Language Processing *(3 credits)*
Natural Language Processing (NLP) is an interdisciplinary field at the intersection of artificial intelligence, linguistics, and computer science, dedicated to enabling computers to understand, interpret, and generate human language. NLP underpins advancements in human-computer interaction, information retrieval, sentiment analysis, chatbots, and a multitude of other applications. The course may cover a wide range of topics, including language modeling, sequence-to-sequence architectures, sentiment analysis, machine translation, and advanced techniques for natural language understanding and generation, providing a comprehensive foundation for NLP expertise.
Recommended Background: Programming skills at the level of CS 5007.

Anticipated Instructor: The course has been taught by Professor Xiaozhong Liu twice before and can also be taught by Professor Kyumin Lee who has taught Information Retrieval (CS 547) and Machine Learning (CS539). We also anticipate recruiting two additional faculty in AI to the Computer Science department in support of the MS in AI program, who may also be able to teach this course.

Rationale:
This course will be offered as an elective course in both the Data Science and the Computer Science graduate programs. In addition, this class will be used in the new Master of Science in Artificial Intelligence programs.

The purpose of this course is to help students to (1) understand the key concepts and models in Natural Language Processing; (2) design, implement, and evaluate the core algorithms for Natural Language Processing; and (3) apply and explore the state-of-the-art NLP tools in the course projects such as ChatGPT.

This course was offered twice as a special topics course, DS 595: "Natural Language Processing", in Fall 2021 and Fall 2022. The following table shows the enrollment, and the average course report ratings students gave on Question #1 (overall course rating), Question #2 (instructor rating), Question #7 (The amount I learned from the course), and Question #12 (well prepared to teach class) on a five-point scale for each class session offered in the previous two years (1 represents "Very Poor" and 5 represents "Excellent").

Year	Term	Course	Course Title	Class Size	Q#1	Q#2	Q#7	Q#12
2022	Fall	DS595/CS525	Natural Language Processing	32	4.1	3.9	3.8	4.8
2021	Fall	DS595/CS525	Natural Language Processing	29	4.5	4.7	4.6	4.8

This table shows that although it was a special topics course, >25 students registered for the course, indicating the popularity and the need of offering the course. Moreover, the capacity for the course when offered was 40.

Resources Needed: This course can be taught in any standard classroom. The course does not have a laboratory component and does not require specific facilities. This course will require students to have access to the WPI computing cluster, including GPU machines.

Impact on Distribution Requirements and Other Courses: This course does not replace any existing courses. It will have minimal impact on existing programs and their distribution requirements.

Implementation Date: The 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add CS555/DS555: Responsible Artificial Intelligence

Motion: On behalf of the Data Science Program and the Computer Science Department, the Committee on Graduate Studies and Research recommends and I move that CS555/DS555: Responsible Artificial Intelligence, as described below, be added.

Proposed Course Description:

CS 555 / DS 555: Responsible Artificial Intelligence *(3 credits)*
Artificial Intelligence (AI) algorithms have a significant impact on people's lives. In this course, we discuss social responsibility around data privacy, bias in data and decision making, policies as guardrails, fairness and transparency in the context of applying AI algorithms. Case studies considering societal challenges caused by AI technologies may include AI-based hiring recommendations stemming from societal biases present in training datasets, AI-empowered self-driving cars behaving in a dangerous manner when encountering atypical road conditions, digital health applications inadvertently revealing private patient information, or large language models like chat-GPT generating incorrect or harmful responses. This course also studies AI-based algorithmic solutions to some of these challenges. These include the design of robust machine learning algorithms with constraints to ensure fairness, privacy, and safety. Strategies for how to apply these methods to design safe and fair AI are introduced. Topics may include min-max optimization with applications to training machine learning models robust to adversarial attacks, stochastic methods for preserving privacy of sensitive data, and multi-agent machine learning models for reducing algorithmic bias and polarization in recommender systems.
Recommended Background: Machine Learning at the graduate level, undergraduate level (CS 4342), or equivalent knowledge.

Anticipated Instructor: The course can be taught by any of the current Computer Science or Data Science faculty with expertise in AI or by the new faculty requested to support the MS in AI program. In particular, current faculty that could teach this course are Prof. Oren Mangoubi and Prof. Fabricio Murai.

Rationale:
This course will be offered as an elective course in both the Data Science and the Computer Science graduate programs. In addition, this class will be used in the new Master of Science in Artificial Intelligence programs.

Resources Needed: This course can be taught in any standard classroom. The course does not have a laboratory component and does not require specific facilities.

Impact on Distribution Requirements and Other Courses: This course does not replace any existing courses. It will have minimal impact on existing programs and their distribution requirements. This course may require students to have access to the WPI computing cluster, including GPU machines.

Implementation Date: The 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add DS 557: Machine Learning for Engineering and Science Applications

Motion: On behalf of the Data Science Program, the Committee on Graduate Studies and Research recommends and I move that a new course, DS 557: Machine Learning for Engineering & Science Applications, as described below, be added.

Proposed Course Description:

DS 557: Machine Learning for Engineering and Science Applications *(Cat. I, 3 credits)*
This course surveys the application of data science (DS) and machine learning (ML) to problems arising in engineering and the sciences. While DS and ML have profoundly affected domains such as image understanding and natural language processing, ML has seen comparatively less impact in chemistry, physics, chemical engineering, electrical engineering, and many other important application domains. Topics covered will include predictive modeling, feature engineering, and model assessment, with a particular focus on the small-data limit. We will analyze and apply algorithms with wide applicability in engineering and sciences including classic techniques such as multiple linear regression and random forests, and state-of-the-art techniques such as deep neural networks.
Recommended Background: The intention is for the class to be accessible to a wide audience in disciplines outside of Computer Science and Data Science, though some basic background topics such as statistics or linear algebra, and the ability to learn Python programming at a basic level would be helpful.

Anticipated Instructors: Associate Professor Randy Paffenroth has taught this course as a special topics course, and he has taught other ML courses. Assistant Professor Oren Mangoubi has taught this course as a special topics course, and he has taught other ML courses.

Rationale:
The intention is for the class to be accessible to a wide audience in disciplines outside of Computer Science and Data Sciences, though some basic background topics such as statistics or linear algebra, and the ability to learn Python programming at a basic level would be helpful. This course helps students to (1) understand the key concepts of Machine Learning; (2) learn how to effectively apply these techniques to the kinds of datasets that arise in engineering and the sciences; and (3) apply and explore ML techniques to real-world datasets in the course projects.

This course was offered twice as a special topic DS 595: "ST: Machine Learning for Engineering & Science Applications" in Spring 2022 and Spring 2023.

The following table shows the enrollment, and the average course report ratings students gave on Question #1 (overall course rating), Question #2 (instructor rating), Question #7 (The amount I learned from the course), and Question #12 (well prepared to teach class) on a five-point scale for each class session offered in the previous two years (1 represents "Very Poor" and 5 represents "Excellent").

Year	Term	Course	Course Title	Class Size	Q#1	Q#2	Q#7	Q#12
2023	Spring	DS595-ST	Machine Learning for Engineering & Science Applications	17	4.33	4.17	4.50	4.50
2022	Spring	DS595-ST	Machine Learning for Engineering & Science Applications	38	4.93	4.90	4.73	4.93

This table shows that although it was a special topics course, >15 students registered for the course, indicating the popularity and the need of offering the course.

Resources Needed: Classroom large enough to hold **40 students**, including a lecture with standard power and projector connections. This course will require students to have access to the WPI computing cluster, including GPU machines.

Impact on Distribution Requirements and Other Courses: The course will be offered as an elective course in the Data Science program and the AI program. This course is available to any majors on campus from sciences to engineering, even without prior programming experience, to learn about machine learning.

Implementation Date: The 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add RBE 511: Swarm Intelligence

Motion: On behalf of the Robotics Engineering Department, the Committee on Graduate Studies and Research recommends and I move that RBE 511: Swarm Intelligence, as described below, be added.

Proposed Course Description:

RBE 511: Swarm Intelligence *(3 credits)*
This course will cover a wide range of topics in swarm intelligence, including mathematical, computational, and biological aspects. The course is organized in four parts. In the first part, the students will learn about complex systems and the basic concepts of self-organization, such as positive and negative feedback, symmetry breaking, and emergence. The second part concerns several types of network models, such as information cascades, epidemics, and voting. The instructor will illustrate a diverse collection of self-organized systems in nature, finance, and technology that concretize these concepts. The third part is dedicated to swarm robotics, and will cover common swarm algorithms for task allocation, collective motion, and collective decision-making. The fourth and final part covers optimization algorithms inspired by swarm intelligence, namely ant colony optimization and particle swarm optimization. The course will blend theory and practice, challenging the students to learn by implementing the algorithms discussed in class through a final project in swarm robotics.
Recommended Background: C++/Python/Matlab programming; Linear algebra; Probability and statistics; Calculus.

Anticipated Instructor: Prof. Carlo Pinciroli has previously taught the course and he, along with Prof. Kevin Leahy will be able to teach future offerings.

Rationale:
Intelligence is a complex phenomenon. The form of intelligence we are most accustomed to is *individual* intelligence, where one agent must reach rational decisions given the information it is provided. A more unfamiliar form of intelligence occurs when multiple agents make local decisions that, combined, produce results that exceed the performance of any individual. This is known as *swarm intelligence*, a phenomenon observed in natural and artificial systems alike. The goal of this course is to expose the students to concepts such as self-organization and emergence, and to teach the students how to conceive of swarm-intelligent systems both to understand naturally occurring collective systems better and to create future artificial systems inspired by these concepts.

This course is unique in its focus and goals when compared to the rest of WPI courses. It fills a gap in our offerings regarding artificial intelligence, robotics, and computer science. As such, this course complements and extends the existing academic offering of the RBE department. Existing courses on artificial intelligence and machine learning do not touch on any of the topics covered by this course. The most closely related course is RBE 510 (Multi-Robot Systems). RBE 510 focuses primarily on generally distributed robotic systems, which includes centralized and partially

centralized approaches as opposed to swarms, which are decentralized. RBE 511 (Swarm Intelligence) is also a semester course, as opposed to the term-long RBE 510 (Multi-Robot Systems). Thanks to its longer schedule, RBE 511 (Swarm Intelligence) goes over a wider range of topics in that it covers more general intelligent systems, of which robots are but an example. RBE 510 (Multi-Robot Systems) is not a prerequisite for RBE511 (Swarm Robotics), and vice versa.

The intended audience of this course is graduate students in Robotics Engineering, Computer Science, and AI.

The proposed course was previously offered by Prof. Pinciroli in the Spring semesters 2018, 2019, 2020, 2021, and 2023 as a cross-listed special topics RBE and CS course with the same title. Course enrollments and evaluations are listed below.

	Enrollment	*Overall Rating*	*Instructor Rating*
Spring 2023	30	4.7	4.8
Spring 2021	22	4.7	4.8
Spring 2020	17	4.4	4.5
Spring 2019	21	4.7	4.9
Spring 2018	22	4.6	4.7

Resources Needed: A classroom with a capacity of 30 seats, a projector, and screen capture is required.

Impact on Degree Requirements: None.

Implementation Date: Implementation date for this action is the 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add RBE 575: Safety and Guarantees for Autonomous Robots

Motion: On behalf of the Robotics Engineering Department, the Committee on Graduate Studies and Research recommends and I move that RBE 575**:** Safety and Guarantees for Autonomous Robots", as described below, be added.

Proposed Course/Catalog Description:

RBE 575: Safety and Guarantees for Autonomous Robots *(3 credits)*
Robotic and AI systems have strong potential to directly impact our well-being, from self-driving cars to medical robots. Therefore, it is important to consider strong guarantees on the correctness and safety of their behavior. These guarantees ensure the robot will execute the desired behavior and will not execute undesired behavior. The course will define formal notions of system properties such as safety and liveness, explain how to model and analyze those properties in systems that make decisions and act on them, and understand the specific challenges related to making guarantees on embodied AI systems. This course will cover many topics related to formal guarantees of safety and correctness in robotic and AI systems, including temporal logic-based planning, safe control via invariants and control barrier functions, neural net verification, closed-loop control with machine learning components, safe reinforcement learning, and other state-of-the-art topics at the intersection of safety, guarantees, AI, and robotics.
Prerequisites: RBE 500.
Recommended Background: Machine Learning or Intro to AI.

Anticipated Instructors: This course is included in the regular teaching load of Professor Kevin Leahy.

Rationale:
Robots and autonomous systems are playing an increasingly large role in the real-world. They also stand to cause potential harm, either due to physical injury to humans or property or due to failure to execute their goals properly. This course aims to provide students with the tools to understand how to mitigate these risks and prove system safety and reliability. The rapid integration of AI and machine learning (ML) into robotic systems makes it especially difficult to guarantee such properties, and this course will introduce students to state-of-the-art tools for safety analysis of AI and ML components in robotic systems. There is currently no course at WPI that covers these topics. As opposed to ethical concerns that are covered in WR 513 or courses on Responsible AI, this course will focus on pragmatic tools for proving system-wide properties of autonomous robots. Likewise, while typical AI curricula deal with robustness, out-of-distribution detection, and other similar topics, they rarely identify the downstream effects of these issues, especially on an autonomous physical platform. The intended audience is graduate students in Robotics Engineering, Computer Science, and AI.

Resources Needed: A classroom with a capacity of 60 seats, a projector, and screen capture is required. The course does not have a laboratory component and does not require specific facilities.

This course will require students to have access to the WPI computing cluster, including GPU machines.

Impact on Degree Requirements and Other Courses: This course does not replace any existing courses. It will have minimal impact on existing programs and their distribution requirements.

Implementation Date: The 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add RBE 577: Machine Learning for Robotics

Motion: On behalf of the Robotics Engineering Department, the Committee on Graduate Studies and Research recommends, and I move that RBE 577: Machine Learning for Robotics, as described below, be added.

Proposed Course Description:

RBE 577: Machine Learning for Robotics (*3 credits*)
This graduate-level course delves into the intersection of machine learning and robotics. The curriculum will explore the integration of contemporary learning techniques in robotic areas such as manipulation, navigation, planning, control, decision-making, and other pertinent challenges in robotics. Advanced deep learning techniques and their applications in robotics will be covered, including supervised learning (e.g., behavioral cloning, state prediction), reinforcement learning (e.g., actor-critic, visual foresight), and unsupervised/self-supervised methods (e.g., world model construction, learning forward dynamic models). In addition, the generalizability of these methods will be discussed, recent, and experimental studies will be conducted, examining the challenges of applying these techniques on physical systems.
Prerequisites: RBE 500 or equivalent
Recommended Background: RBE 501 and RBE 502.

Anticipated Instructors: This course is included in the regular teaching load of Prof. Constantinos Chamzas.

Rationale:
With the transformative impact of machine learning across various industries, its extensive applications in robotics have become increasingly prevalent. The "Machine Learning for Robotics" course aims to train individuals to be proficient at advanced machine learning methods in the domain of robotics. With an emphasis on state-of-the-art deep learning techniques, the course equips students to adeptly navigate learning applications in robotics, critically evaluate novel learning algorithms, and acquire practical skills in both simulated and real-world settings. The current WPI curriculum lacks a comprehensive exploration of these topics. While existing courses like RBE 470X (Artificial Intelligence for Robotics), CS 541(Deep Learning), and DS 551 (Reinforcement Learning) offer valuable insights, they only partially cover relevant aspects, representing approximately 5-10 percent of the proposed curriculum. The suggested course specifically emphasizes the integration of these methods into robotic applications and the conceptualization of diverse robotics challenges as learning problems. The intended audience is graduate students in Robotics Engineering, Computer Science, and AI.

Resources Needed: A classroom with a capacity of 60 seats, a projector, and screen capture is required. Access to the GPU cluster to run student projects would be requested.

Impact on Degree Requirements and Other Courses: This course does not replace any existing courses. It will have minimal impact on existing programs and their distribution requirements.

Implementation Date: The 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add SS560: Artificial Intelligence: Exploring Technology, Ethics and Policy

Motion: On behalf of the Social Science & Policy Studies Department, the Committee on Graduate Studies and Research recommends and I move that SS560: Artificial Intelligence: Exploring Technology, Ethics and Policy, as described below, be added.

Proposed Course Description:

SS 560: Artificial Intelligence: Exploring Technology, Ethics and Policy (*3 credits*)
In the rapidly evolving landscape of technology, artificial intelligence (AI) has emerged as a transformative force with significant implications for public policy. This course is designed to provide students with a comprehensive understanding of challenges and opportunities AI brings to society and attendant policy debates. Throughout the course, students will learn both knowledge and tools enabling them to critically analyze and contribute to policy formation, implementation, assessment of AI related polices. The course will prepare students to engage in ongoing policy and emergent policy debates that reflect AI's impact on society. Students will be able to make ethically informed decisions about the intersection of technology, policy, and society.
Prerequisites: None.

Anticipated Instructor: The course can be taught by any of the current SSPS faculty with expertise in policy.

Rationale:
This class will be offered to students in the Data Science and in the Computer Science programs. It will also be available to students in the Master of Science in Artificial Intelligence program.

Resources Needed: This course can be taught in any standard classroom. The course does not have a laboratory component and does not require specific facilities.

Impact on Distribution Requirements and Other Courses: This course does not replace any existing courses. It will have minimal impact on existing programs and their distribution requirements.

Implementation Date: The course would be added in the 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to add ECE556/CS556/DS556: On-Device Deep Learning

Motion: On behalf of the Electrical and Computer Engineering Department, Computer Science Department, and the Data Science Program, the Committee on Graduate Studies and Research recommends and I move that ECE556/ CS556/ DS556: On-Device Deep Learning, as described below, be added.

Proposed Course Description:

ECE 556/ CS 556/ DS 556: On-Device Deep Learning (3 credits)
Deep Learning, a core of modern Artificial Intelligence, is rapidly expanding to resource-constrained devices, including smartphones, wearables, and intelligent embedded systems for improving response time, privacy, and reliability. This course focuses on bringing these powerful deep-learning applications from central data centers and large GPUs to distributed ubiquitous systems. On-Device Deep Learning is an interdisciplinary topic at the intersection of artificial intelligence and ubiquitous systems, dedicated to enabling computing on edge devices. This course includes a wide range of topics related to deep learning in resource constrained settings including pruning and sparsity, quantization, neural architecture search, knowledge distillation, on-device training and transfer learning, distributed training, gradient compression, federated learning, efficient data movement and accelerator design, dynamic network inference, and advanced compression and approximation techniques for enabling on-device deep neural network inference and training. This course provides a comprehensive foundation for cutting-edge "tinyML" expertise.
Recommended background: The students should have an introductory undergraduate-level or graduate-level introductory background in machine learning and deep neural networks.

Anticipated Instructor: The course is currently being taught by Assistant Professor Bashima Islam and other faculty in AI and/or systems can teach this course in future offerings.

Rationale:
This class is important to the ECE graduate program, as deep learning is related to classical signal processing content traditionally taught in ECE, and is also expected to serve as a course in the Machine Learning Bin of the currently proposed Master of Science in Artificial Intelligence program. In addition, due to the interdisciplinary nature of the material, the course is cross-listed with the Data Science and Computer Science graduate programs.

Deep learning has shown promise in solving multi-faceted real-world problems. The recent development of more computationally powerful embedded processors and deep learning accelerators opened the door to on-device deep neural inference. However, running existing DNN models in these tiny computers with limited memory and computation capabilities is challenging. Thus, understanding the concepts, algorithms, theories, and applications of how to enable intelligence in these small computers is fundamental to engineering related to the goal of the intelligent world. This course will be a symphony of theory and practical (lab) components where

the students will learn the theory and intuitions behind each algorithm and will be able to deploy them in an actual smartphone or embedded system.

The purpose of this course is to help students to (1) understand the key concepts and models for enabling on-device deep learning; (2) design, implement, and evaluate the core algorithms for enabling on-device deep learning; and (3) apply and explore the state-of-the-art on-device deep learning tools in the course projects.

This course is currently being offered as a special topic ECE556/ CS556/ DS556: On-Device Deep Learning in Fall 2023, with 24 students currently enrolled.

This course integrates AI and Systems to beneficiate a wide range of applications, e.g., computer vision, natural language processing, human activity recognition, acoustic sensing, and passive monitoring in healthcare and environmental science.

Resources Needed: This course can be taught in any standard classroom. The course does not have a laboratory component and does not require specific facilities. This course will require students to have access to the WPI computing cluster, including GPU machines.

Impact on Distribution Requirements and Other Courses: This course does not replace any existing courses. It will have minimal impact on existing programs and their distribution requirements.

Implementation Date: The 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, chair)
Re: Motion to add ECE 571: Machine Learning Engineering Applications

Motion:
On behalf of the Electrical and Computer Engineering Department, the Committee on Graduate Studies and Research recommends and I move that ECE 571: Machine Learning Engineering Applications, as described below, be added.

Proposed Course Description:
ECE 571: Machine Learning for Engineering Applications *(Cat. I; 3 credits)*
This is an introductory course for engineering students to gain basic knowledge of machine learning and its applications. This course's objective is to learn machine learning theory and then apply it in engineering practice. A major emphasis of the course is to foster the capability of combining multiple machine learning techniques in complex problem solving, such as the detection of deepfake media. Topics include supervised learning, linear regression, kernel methods, support vector machine, neural networks, unsupervised learning, clustering, principal component analysis, deep learning with convolutional neural networks, and reinforcement learning. Students will develop software to implement machine learning and deep learning algorithms for practical engineering applications.
Prerequisites: Basic knowledge of probability and computer programming.

Rationale:
This course has been offered as an experimental special topic course "ECE579 Machine Learning for Engineering Applications" each year since Fall 2019. It provides an opportunity for students who are not majoring in computer science to gain general knowledge of machine learning and apply machine learning techniques to solve practical engineering problems. The course has attracted a sizable number of engineering graduate students to enroll each year. 17 students took the course in 2019, 18 students in 2020, 6 students in 2021 and 10 students in 2022. The course evaluations were positive from the students' feedback.

The popularity of machine learning and artificial intelligence in general has attracted lots of attention in engineering fields. While our existing engineering programs are strong, we need to extend our strength by including the latest technologies such as machine learning and artificial intelligence, in response to the needs of industry and our society.

Learning Outcomes:
Student successfully completing the course:
1. Will understand the machine learning theory and general algorithms.
2. Will understand the existing deep learning techniques.
3. Will be able to apply machine learning and deep learning techniques to practical engineering applications.

Impact on Degree Requirements: The offered course can be counted as 3 credits towards Master or PhD programs.

Resources Needed: The course does not require any major resources. Only the basics are necessary such as a book and a computer for programming and presentations.

Anticipated Instructors: The ECE department has four or more faculty who have expertise on machine learning for engineering, so the instructors are available.

Implementation: The implementation date for this action is the 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, chair)
Re: Motion to add ECE 575: Blockchain and Cryptocurrencies

Motion:
On behalf of the Electrical and Computer Engineering Department, the Committee on Graduate Studies and Research recommends and I move that ECE 575: Blockchain and Cryptocurrencies, as described below, be added.

Proposed Course Description:
ECE 575: Blockchain and Cryptocurrencies *(3 credits)*
The introduction of cryptocurrencies has had significant financial, socioeconomic, and technological effects. This course introduces the technical aspects of blockchain technologies, consensus protocols and cryptocurrencies. The course emphasizes the engineering aspects of blockchain implementation towards efficiency, scalability, and security in practical blockchain designs. Students will learn the basics of blockchain systems to create cryptocurrencies. They will learn to identify the performance bottlenecks in blockchain systems and study new blockchain design proposals to learn how these bottlenecks are overcome. Further, the course will also cover the basics of Ethereum and smart contracts. Students will have the chance to learn programming smart contracts.

Rationale:
Blockchain is a new and emerging technology where a lot of applications are enabled. It is a multidisciplinary subject that involves electronics, computer science, economics, finance, data science and many other fields. Therefore, many Tech Companies are looking for employees with expertise in designing and using blockchain technologies. Furthermore, this recent technology gives a new direction to the finance industry, which is also covered in the course. Another aspect of the course is the Smart Contract (Solidity Language) technology which enables blockchain technologies to be more than just cryptocurrencies. The applications are limitless, and companies are looking for engineers that can implement projects in Smart Contracts (Solidity), which is also covered by this course.

The course is popular and was taken over the years by a diverse body of students. The course is interdisciplinary and was taken by ECE, CS (Computer Science) and Data Science students. Furthermore, the course's popularity can be seen from the number of students registered over the years: 8 students in 2019, 17 students in 2020, 6 students in 2021, and 11 students in 2023. Also, the course evaluations of the students throughout the years were between 4.2-4.4 for the overall rating and the feedback was positive in which many of the students encouraged their friends to take the course.

Impact on Degree Requirements: The offered course can be counted as 3 credits towards Master and PhD programs. Also, ECE/CS has a joint “master's in cyber security” Program and this course is one of the offerings that can be counted towards the requirement the human-behavior-focused course.

Resources Needed: The course does not require any major resources. Only the basics are necessary; a book which is free to download the online version and a laptop for programming and presentations.

Anticipated Instructors: The anticipated instructor is a Teaching Assistant Professor. The course is related to security, so any instructor that works in the security field can teach the course in case of a leave and the ECE department has many instructors that work in the security field.

Implementation: Implementation date for this action is the 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, chair)
Re: Motion to add ECE 576 Applied Cryptography and Physical Attacks

Motion:
On behalf of the Electrical and Computer Engineering Department, the Committee on Graduate Studies and Research recommends and I move that ECE 576 Applied Cryptography and Physical Attacks, as described below, be added.

Proposed Course Description:
ECE 576 Applied Cryptography and Physical Attacks *(3 credits)*
In this course, we aim to study security and trust from the hardware perspective. The three main objectives of hardware security that we will cover are secure key generation and storage as well as secure execution. Specifically, we will learn how cryptographic algorithms can become susceptible to physical attacks and how this can be prevented. Topics to be covered in this course include basics of hardware security and its objectives; random number generation; physically unclonable functions; invasive and non-invasive attacks, e.g., side-channel analysis and fault injection; counterfeit detection; semiconductor IP (Intellectual Property) protection.

Rationale:
This course has been taught since 2013, although it was discontinued in 2017 when the former instructor left WPI. The course has been rejuvenated to cover a wider range of timely topics in 2022 by the current instructor, Prof. Ganji. In Fall 2022, 16 students took this course, and the overall rating was 4.3. In Fall 2023, 21 students have enrolled in the course.

The change to a permanent graduate course will not affect the operation of the course. The course will be seamlessly taught in Fall 2024.

Impact on Degree Requirements: This course will not have any impact on the degree requirement.

Resources Needed:
The resources are as follows.

- Y. Oren, "Coursebook for Attacks on Implementations of Secure Systems," [Online at https://orenlab.sise.bgu.ac.il/AttacksonImplementationsCourseBook/]
- I. Verbauwhede, "Hardware Security," Chapter 18 in "The Cyber Security Body of Knowledge," Bristol, UK, University of Bristol, 2019. [Online at https://www.cybok.org/media/downloads/CyBOK-version-1.0.pdf]
- C. Paar, J. Pelzl, "Understanding Cryptography: A Textbook for Students and Practitioners," Springer Berlin, Heidelberg, 2009. Doi: 10.1007/978-3-642-04101-3

Anticipated Instructor: Prof. Ganji will continue teaching this course.

Implementation Date
The implementation date for this action is the 2024-2025 academic year.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, chair)
Re: Motion to update the course numbers in the requirements for the M.S. in Cyber Security

Motion: On behalf of the Electrical and Computer Engineering Department, the Committee on Graduate Studies and Research recommends and I move that the numbers in the requirements for the M.S. in Cyber Security (MS-SEC) be updated in the graduate catalog, as described below.

Description of the Proposed Changes:
Course numbers to be changed (on page 188 of the 2023-24 Graduate Catalog):

Under Section:
Requirements for the Master of Science in Cyber Security (MS-SEC)

Under Sub-section:
MS-SEC students must complete a three-course core focused on technical, human behavior, and business:

Current Reference	**Proposed New Reference**
ECE 579B Blockchain and Cryptocurrencies	ECE575 Blockchain and Cryptocurrencies
ECE 579C Applied Cryptography and Physical Attacks	ECE576 Applied Cryptography and Physical Attacks

Rationale:
Both ECE575 and ECE576 have been approved as permanent courses by the Electrical and Computer Engineering Department and Cybersecurity Graduate Program as permanent courses, and corresponding motions are included in the consent agenda for the Dec. 6 2023 faculty meeting.

These changes will update the graduate catalog accordingly.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, Chair)
Re: Motion to modify the course description and number of credits for BB 501 Seminar

Motion: On behalf of the Biology and Biotechnology Department, the Committee on Graduate Studies and Research recommends and I move that the course description and the number of credits for BB 501 Seminar be modified, as described below.

Description of the Proposed Modifications:

Current Course Description: (see page 384 of 2023-24 Graduate Catalog)

BB 501: Seminar
This course will help students develop scientific communication skills through their attendance and participation in weekly research seminars. Research talks will include both external guest speakers and graduate students from the Biology and Biotechnology department, giving students an opportunity to learn by example while also honing their data presentation and communication skills through practice. Students will receive feedback from an audience of their peers and departmental faculty. Talks given by guest speakers will be paired with informal meetings between the guest and students to promote networking and broaden the student's exposure to the greater scientific community.

Credits: 1

Proposed Course Description:

BB 501 Seminar *(0 credits; P/F)*
This course will help students develop scientific communication skills through their attendance and participation in weekly research seminars. Research talks will include both external guest speakers and graduate students from the Biology and Biotechnology department, giving students an opportunity to learn by example while also honing their data presentation and communication skills through practice. Students will receive feedback from an audience of their peers and departmental faculty. Talks given by guest speakers will be paired with informal meetings between the guest and students to promote networking and broaden the student's exposure to the greater scientific community. This course is a requirement for the PhD degree in Biology and Biotechnology and it is expected that both Ph.D. and M.S. students register for it each semester that they are enrolled in the program.

Rationale:
The seminar course is designed for students to attend each semester throughout their graduate training. Our original intent in making the seminar a credit-bearing course was to ensure that students took it seriously and attended. However, the corresponding limit to the number of times a student can receive credit for registering for this course had the unintended consequence of dissuading PhD students from attending seminar once this limit had been reached (1/2 way through their PhD training). Additionally, given that grading is based primarily on attendance, we do not feel this course merits 1 credit. Finally, with most graduate students getting 9 credits tuition

support per semester (including TAs who had once received 10 tuition credits per semester), having to pay for this credit is problematic if they are already taking 3 courses.

By changing the course to 0 credits, we believe we will achieve our original intent to encourage attendance (since students will not want an F on their transcript, even with no credit attached), without the problems mentioned above.

Impact on Degree Requirements: Ph.D. candidates are required to take the seminar every semester but can currently only count 5 credits of BB 501(ie 5 semesters) towards their degree. By changing this requirement, we will increase the number of credits students must complete in other areas to graduate. We expect that most will take additional courses or research credits, which will be to their benefit. Master's students are not currently required to enroll in the seminar. This change will make it easy for the faculty to strongly encourage them to do so.

Resources and Anticipated Instructors: No additional resources are required.

Implementation Date: Implementation date for this action is the 2024-2025 academic year, spring semester.

Date: December 6, 2023
To: WPI Faculty
From: Committee on Graduate Studies and Research (Prof. Olson, chair)
Re: Motion to modify the M.S. and Ph.D. degree requirements in BBT related to BB 501 Seminar

Motion: On behalf of the Biology and Biotechnology Department, the Committee on Graduate Studies and Research recommends and I move that the M.S. and Ph.D. degree requirements in Biology and Biotechnology related to BB 501 Seminar be modified, as described below.

Description of the Proposed Changes:

Current Graduate Catalog Descriptions:

(On pages 204-205 of the 2023-24 Graduate Catalog)
M.S. in Biology and Biotechnology:

Students pursuing the M.S. degree in Biology and Biotechnology must successfully complete a minimum of 30 credit hours of course and thesis work per the distribution requirement below. All courses must be at the 500 or 4000 level and no more than 9 credits may be at the 4000 level. An approved list is provided in the department's graduate handbook.

Students must assemble an Advisory Committee of three or more faculty members of which a majority must be Biology and Biotechnology program faculty members. The Advisory Committee must review and approve each M.S. student's program of study and thesis research. Students must successfully complete a thesis including a written thesis and oral defense.

(On page 205-206 of the 2023-24 Graduate Catalog)
Ph.D. in Biology and Biotechnology:

Required Coursework: BB501 is a one credit course that must be taken five times
BB554 is a one credit course that must be taken three times
BB551 Research Integrity in the sciences
BB552 Scientific Writing and Proposal Development
BB556 Mentored Teaching Experience
Biostatistics

Minimum Credits 15

Electives within Biology and Biotechnology: Twelve elective credits required from within the department.

Minimum Credits 12

Proposed Graduate Catalog Descriptions:
(with changes in red)

(On page 238 of the 2023-24 Grad Catalog)
BB 501: Seminar
Credits: 0

(On pages 204-205 of the 2023-24 Graduate Catalog)
M.S. in Biology and Biotechnology:

Students pursuing the M.S. degree in Biology and Biotechnology must successfully complete a minimum of 30 credit hours of course and thesis work per the distribution requirement below. Students are expected to register for BB 501 Seminar, a zero credit course, each semester that they are enrolled in the program. All courses must be at the 500 or 4000 level and no more than 9 credits may be at the 4000 level. An approved list is provided in the department's graduate handbook.

Students must assemble an Advisory Committee of three or more faculty members of which a majority must be Biology and Biotechnology program faculty members. The Advisory Committee must review and approve each M.S. student's program of study and thesis research. Students must successfully complete a thesis including a written thesis and oral defense.

(On pages 205-206 of the 2023-24 Graduate Catalog)
Ph.D. in Biology and Biotechnology:

Required Coursework: BB501 is a zero credit course that must be taken each semester that a student is enrolled in the program
BB554 is a one credit course that must be taken three times
BB551 Research Integrity in the sciences
BB552 Scientific Writing and Proposal Development
BB556 Mentored Teaching Experience
Biostatistics

Minimum Credits 10

Electives within Biology and Biotechnology: Fifteen elective credits required from within the department.

Minimum Credits 15

Rationale:
These changes will clarify the expectation or requirement of students to register for BB 501 each semester of their enrollment in the M.S, or Ph.D. program in Biology and Biotechnology and also clarify the zero credit value for this course.

Impact on Degree Requirements: NA

Resources Needed and Anticipated Instructors: No additional resources are required.

Implementation Date: Implementation date for this action is the 2024-2025 academic year.