Course Title: Logic programming for Biomedical Informatics

Department of Biomedical Informatics
Jacobs School of Medicine and Biomedical Sciences

Course Subject Code:	BMI
Course Number:	521
Type of Instruction:	SEM
Class Number:	24384
Semester:	Fall 2023

1 COURSE INFORMATION

- Date(s)/Time(s):   Fridays, 10am – 12.50pm
- Delivery Mode: Hybrid: classes remote real-time online with recording for backup, final exam in person.
- Number of Credits: 3
- Course director / instructor: Werner Ceusters, MD (contact: wceusters@gmail.com)

2 CONTENTS

3 COURSE DESCRIPTION

- This course introduces students to logic programming (LP), a paradigm which is largely based on formal logic. LP programs consist of a set of sentences in one or other logical form which express conditions, constraints and consequences about some problem domain. Inferences are carried out following logical principles on the basis of assertions. LP is used for applications such as natural language processing, automated knowledge discovery, inductive machine learning, verification of deep learning models, and the development and consistency checking of ontologies. In this seminar, students will gain hands-on implementation experience with Prolog, a logic programming language standardized in ISO/IEC13211-1 and -2. They will apply Prolog to a variety of problems within the domain of biomedical informatics (BMI) and investigate the ways in which it complements numerical machine learning methods.
- The course starts with a theoretical introduction covering the formal logics frequently used in BMI (propositional logic, 1st order logic and description logics) and how LP relates to formal logic and other programming languages. This will be followed by an overview of Prolog as a declarative programming language. Students will perform several simple guided exercises covering the basics of unification, back tracking, forward chaining, input- and output and database management.
- The second part of the course consists of various exercises using SemMedDb, a database containing over 117 million predications derived from nearly 34 million medical abstracts, made available by the National Library of Medicine. The goal is to make students familiar with the challenges involved in logically and/or ontologically inconsistent big analytics databases and how logic programming can be used to find and work with inconsistencies.
- In the third and final part of the course, students will as a final course project use Prolog to build a small application solving one or other life science problem of their choice. Both individual and collaborative approaches will be applied.
- Course prerequisites: none.

4 STUDENT LEARNING OUTCOMES (SLO)

4.1 Course Learning Outcomes

The following table lists the SLOs specifically for this course, thereby showing in which classes these SLOs will be covered and what degree of learning is aimed for (introduced, reinforced or mastered). The last column indicates the relationships of the SLOs with the assessment criteria for the assignments by means of which the SLOs will be assessed (see section 11 below).

Course Learning Outcome ID	Students will be able to:	Class (Introduced / Reinforced / Mastered)		Assessed
CLO1	Explain the relationships between formal logic, logic programming, and machine learning	• W1 (I) • W6 (M)	• W2 (R)	A2:a
CLO2	Implement logic programs with simple to medium complexity in Prolog	• W3 (I) • W4 (I) • W5 (R)	• W6 (R) • W7 (R) • W12 (R) • W13 (M)	A2:c A4:a
CLO3	Understand the principles to discover and resolve logical inconsistencies in big analytic databases	• W8 (I) • W9(R)	• W10 (M)	A4:b
CLO4	Implement in Prolog logic-based quality controls for big biomedical databases	• W8 (I) • W9(R)	• W10 (M)	A4:a
CLO5	Develop requirements specifications for biomedical knowledge-based applications	• W11 (I)		A5 A6:b
CLO6	Implement a variety of logic-based queries for biomedical applications.	• W2 (I) • W9 (R)	• W13 (M)	A2:d A6:b
CLO7	Identify opportunities to combine logic programming with numerical data analytics.	• W5 (I)	• W9 (R)	A4:a A6:b
CLO8	Reflect on challenges encountered, lessons learned and remaining gaps in knowledge and skills with respect to logic programming for biomedical applications.	• W13 (M) • W14 (M)		A4:b A6:a

4.2   BMI PhD Program Outcomes / Competencies for the concentration in Biomedical Ontology

The following table lists the SLOs for PhD students in Biomedical Informatics with a concentration in Biomedical Ontology, applicable to this course. The table shows in which classes these SLOs will be covered and what degree of learning is aimed for (introduced, reinforced or mastered). The last column indicates the relationships of the SLOs with the assessment criteria for the assignments by means of which the SLOs will be assessed (see section 11 below).

Outcome ID	BMI PhD Program Outcomes / Competencies In Biomedical Ontology	Class (Introduced / Reinforced / Mastered)		Assessed
CSPO1	Methods of data representation, manipulation, storage, analysis and mining in healthcare and biomedical research databases	• W4 (R)	• W10 (R)	A2:b A4:a.b
CSPO2	Technical approaches to acquiring, modeling, representing and managing healthcare and biomedical research knowledge	• W4 (R)	• W10 (R)	A4:a.b A6:b
CSPO3	Information retrieval and critical analysis skills			A4:b A6:a

4.3   General BMI PhD program outcomes

The following table lists the SLOs for all PhD students in Biomedical Informatics, independent of concentration, applicable to this course. The table shows in which classes these SLOs will be covered and what degree of learning is aimed for (introduced, reinforced or mastered). The last column indicates the relationships of the SLOs with the assessment criteria for the assignments by means of which the SLOs will be assessed (see section 11 below).

ID	Description	Class (Introduced / Reinforced / Mastered)		Assessed
PLO1	Have in-depth knowledge about and be able to discuss general key biomedical informatics concepts, models and theories and the major information management challenges and opportunities existing within various types of healthcare information systems			A6:a
PLO3	The knowledge and skills needed to use information management systems and tools, and to implement effective information management systems within the scope of the biomedical informatics subspecialty the PhD students selected for their thesis.	• W11 (M)	• W12 (M)	A6:a.b
PLO5	Advanced understanding of cutting-edge techniques and technologies to address difficult problems pertaining to the biomedical informatics subspecialty the PhD students selected for their thesis.	• W11 (M)	• W12 (M)	A6:a.b

4.4   Institutional learning outcomes

The following table outlines the Institutional Outcomes set forth for graduate students at UB. The table shows in which classes these SLOs, where applicable, will be covered and what degree of learning is aimed for (introduced, reinforced or mastered). The last column indicates the relationships of the SLOs with the assessment criteria for the assignments by means of which the SLOs will be assessed (see section 11 below).

ID	Learning outcome	Class (Introduced / Reinforced / Mastered)		Assessed
ILO1	**Critical Reasoning** — Demonstrate domain expertise, including critical reasoning and analysis.	• W7 (R)	• W10 (R)	A4:b A6:a
ILO2	**Literacy Skills** — Apply effective communication, information, and digital literacy skills.			A2:e A6:a
ILO5	**Collaborate Positively** — Collaborate positively with others to achieve a common purpose.	• W9 (R) • W10 (R)		

ILO6	**Personal Skills** — Assess, articulate, and acknowledge personal skills, abilities and growth areas.		A4:b A6:a

5 COURSE REQUIREMENTS

- Students are required to read 4 papers as listed in the course materials in section 12 below.
- Students must attend all classes and must participate in class discussions. See attendance policy regulations for exceptions in section 13 below. Classes will be recorded for documentation purposes and to offer students further opportunities to go over the material once more. The availability of recordings is no excuse for not attending the classes.
- Some classes may include a surprise in-class test, i.e. a test during the scheduled class time or a short assignment to be done on the spot. Students can earn extra credits for these, but will not be penalized in case of partial or total failure.
- All assignments need to be completed prior to the deadline specified in the course schedule and uploaded to https://buffalo.box.com/s/tvfprgdopiz7ktilpbn31xeb0lylvwm6. No Google doc links or any other links to a cloud server are allowed.
- The filename of assignments should be formatted in the following way: BMI521-[number of the assignment]-[your UBIT name].[file-extension].
  For example, if the course director were a student and the requested file a Word document: "BMI708-A1-ceusters.docx".
- The date and time in the metadata header of the upload through which the completed assignments will be received will be taken for assessment of in-time delivery.
- The first line in the documents should always contain the student's full name (first and last name) and email address. When the assignment is a piece of Prolog code, this line should be marked as comment so as not to hamper the execution of the program.
- Where assignments require documentation and rationales for design choices made, in addition to Prolog source-code, it is advised that the file with Prolog source-code contains short coding comments, but also that the entire implementation file is copied in a Word document, and that extensive documentation is then provided in that Word document. Both files, each with the same name except for the extension, should then be submitted at the same time, in the same email. Prolog source-code files should have the extension '.pl' for transmission.
- Since most assignments build further on previous ones, good documentation of the work will help students in picking up where they left.
- When assignments are delivered past the due date without prior consent by the instructor, they will not be assessed or corrected and will lead to loss of the allotted amount of points towards the final grade. Students unable to meet the deadline must inform the instructor by email and provide a valid reason prior to reaching the deadline. An alternative assignment and/or due date can then be agreed upon, be it entirely to the discretion of the instructor.
- You may email me at any time, exclusively at wceusters@gmail.com. Mails related to the class should in the subject line be prefixed with 'BMI521:', otherwise they will be ignored and not answered.
- The course will primarily consist of short lectures and much longer guided exercises. These exercises, together with the assignments A1 to A5, are selected in such a way that they contribute content-wise to the final assignment A6 to a large extent. Students should keep this evolutionary aspect in mind and are therefore advised to document their assignments and corrections thereof together with material offered during class in such a way that their A6 (see section 11.6 below) is almost completed by the end of W13.
- Students MUST participate in the course evaluation process.

6 GRADING POLICY

Grading follows standard graduate policies (http://grad.buffalo.edu/Academics/Policies-Procedures/Grading-Procedures.html). The following break-down will be used:

Final score weighting	Assignment
1%	A1
8%	A2
1%	A3
10%	A4
5%	A5
60%	A6
15%	Final exam
100%	

- How the assignments will be assessed is described in section 11, page 7. Note that most emphasis is on self-evaluation and description of issues, and NOT on success or failure of a final project implementation.
- Extra credits obtained will be added after all assignments have been completed and assessed.

- Final scores may be curved upwards by the instructor upon his discretion.

Final Grades:

Grade	Quality Points	Percentage
A	4.0	93.0% -100.00%
A-	3.67	90.0% - 92.9%
B+	3.33	87.0% - 89.9%
B	3.00	83.0% - 86.9%
B-	2.67	80.0% - 82.9%
C+	2.33	77.0% - 79.9%
C	2.00	73.0% - 76.9%
C-	1.67	70.0% - 72.9%
D+	1.33	67.0% - 69.9%
D	1.00	60.0% - 66.9%
F	0	59.9 or below

The following F-grades might be assigned:
- F1 (for a student who participated beyond the 60% point of the class)
- F2 (for a student who started participating, but stopped prior to the 60% point of the class)
- F3 (for a student who did not participate in the class)

An interim grade of Incomplete (I) may be assigned if the student has not completed all requirements for the course. An interim grade of 'I' shall not be assigned to a student who did not attend the course. The default grade accompanying an interim grade of 'I' shall be any of the standard grades from the table above, including F1 and F2. The default grade shall become the permanent course grade of record if the 'I/x' grade is not changed through formal notice by the instructor upon the student's completion of the course.
An incomplete grade can be assigned only if successful completion of unfulfilled course requirements can result in a final grade better than the default grade.

7 ACADEMIC INTEGRITY

Academic integrity is a fundamental university value and critical to the learning process. Through the honest completion of academic work, students sustain the integrity of the university while facilitating the university's imperative for the transmission of knowledge and culture based upon the generation of new and innovative ideas. It is your responsibility as a student to complete your work in an honest fashion, upholding the expectations your individual instructors have for you in this regard. The ultimate goal is to ensure that you learn the content in your courses in accordance with UB's academic integrity principles, regardless of whether instruction is in-person or remote. Thank you for upholding your own personal integrity and ensuring UB's tradition of academic excellence. See http://grad.buffalo.edu/Academics/Policies-Procedures/Academic-Integrity.html.

8 ACCESSIBILITY RESOURCES

If you have any disability which requires reasonable accommodations to enable you to participate in this course, please contact the Office of Accessibility Resources in 60 Capen Hall, 716-645-2608 and also the instructor of this course during the first week of class. The office will provide you with information and review appropriate arrangements for reasonable accommodations, which can be found on the web at: http://www.buffalo.edu/studentlife/who-we-are/departments/accessibility.html.

9 COURSE FEES

Standard UB tuition and fees. No extra costs.

10 COURSE ORGANIZATION / SCHEDULE

Reference: http://registrar.buffalo.edu/calendars/academic/

Week	Covered SLOs (Level)		Topics	Pre-class requirements	Educational method	Assignment
W1 Sept 1	CLO1 (I)		• House keeping • Course overview • Structure and content of final course report (A6) and how to get there. • History of artificial intelligence and machine learning in medicine.	• Read R1 (https://www.forbes.com/sites/robtoews/2019/11/17/to-understand-the-future-of-ai-study-its-past/)	• Lecture • Discussion	A1 due Sept 8, 10am
W2 Sept 8	CLO1 (R) CLO6 (I)		• Formal logic and logic programming • Solving students' issues with Prolog installation (if any).	• Read R2 (https://www.finsliqblog.com/programming-languages/programming-languages-used-for-logic-programming/)	• Lecture	
W3 Sept 15	CLO2 (I)		• Basics of Prolog I: syntax (facts, rules, queries), negation, unification, backtracking, recursion		• Guided hands-on exercises	
W4 Sept 22	CLO2 (I)	CSPO1 (R) CSPO2 (R)	• Basics of Prolog II: data structures, input and output		• Guided hands-on exercises	
W5 Sept 29	CLO1 (R) CLO2 (R) CLO7 (I)		• Basics of Prolog III: combining symbolic processing with numerical computation		• Guided hands-on exercises	
W6 Oct 6	CLO1 (M) CLO2 (R)		• Prolog implementations of knowledge bases, ontologies and Referent Tracking		• Lecture • Guided exercise on representing anatomy	A2 due Oct 11, noon
W7 Oct 13	CLO2 (R) ILO1 (R)		• Evaluation and alternative solutions of assignment A2		• Guided exercise	A3 due Oct 20, 10am
W8 Oct 20	CLO3 (I) CLO4 (I)		• Analysis of and access to SemMedDb via Prolog. • Basic database operations on SemMedDb	• Read R3 (https://bmcbioinformatics.biomedcentral.com/articles/10.1186/s12859-020-3517-7)	• Lecture • Guided exercise	
W9 Oct 27	CLO3 (R) CLO4 (R) CLO6 (R)	CLO7 (R) ILO5 (R)	• Quality control of SemMedDB	• Read R4 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7882417/)	• Guided exercise	A4 due Nov 1, noon
W10 Nov 3	CLO3 (M) CLO4 (M) ILO1 (R)	CSPO1 (R) CSPO2 (R) ILO5 (R)	• Evaluation, discussion and areas for improvement re assignment A4		• Discussion and guided exercise	
W11 Nov 10	CLO5 (I) PLO3 (M) PLO5 (M)		• Discussion on final project topics • Writing requirements specifications		• Discussion • Lecture	A5 due Nov 15, noon
W12 Nov 17	CLO2 (M) PLO3 (M) PLO5 (M)		• Evaluation and discussion of A5 • Final project implementation assistance		• Discussion • Guided project implementation	
Nov 24	NO CLASS					
W13 Dec 1	CLO2 (M) CLO6 (M) CLO8 (M)		• Final project implementation assistance		• Guided project implementation	A6 due Dec 6, noon
W14 Dec 8	CLO14 (M)		• Final project presentations • Course wrap-up.	•		
Dec 15	Final Exam					

11 ASSIGNMENTS

11.1   A1: Have Prolog and suitable code-editor installed on your machine and ready to use

- Most Prolog-interpreters are freely available and students are free to work with the one of their choice. However, although most Prolog-versions follow the ISO-standard, they all differ in the amount and quality of built-in predicates as well as of available special-purpose packages. The instructor will use SWI-Prolog (https://www.swi-prolog.org/Download.html) and a special package to read and write csv-files. Students are therefore recommended to do the same.
- It is also advisable to install a good coding-editor to write Prolog programs. If you don't have one, I recommend for maximal functionality NotePad++ (https://notepad-plus-plus.org/downloads/). It has excellent features to separate coding from comments, to work with multiple files, and, most importantly, provides visual assistance for matching opening- and closing parentheses and brackets and makes it thus easier to work with Prolog datastructures.
- Due date: W2, prior to beginning of the class.
- Assessment: all software installed or provably attempted to do so. List of issues encountered ready for discussion and remediation in W2.

11.2   A2. Representation of anatomy

- Class W6 will consist of a guided exercise in representing canonical gross anatomical knowledge about a right human hand. Students will learn the principles for deciding what sorts of knowledge needs to be stored in (1) a terminology, (2) an ontology, and (3) a knowledge base of axioms, as well as the principles of Referent Tracking to apply the knowledge to individual persons. They will learn how to implement these different components in Prolog. The assignment consists of expanding the knowledge base to include gross anatomy of both arms and the upper torso. Concrete instructions will be given in class based upon the understanding about logic programming students acquired thus far as well as about which anatomical entities and relations amongst them to represent. Students must document their work and reflect on decisions taken and outstanding problems.
- The assignment needs to be done individually.
- Due date: two days prior to W7, noon.
- Assessment:

Assessment criteria	Weight	Assessed SLOs
a. Correct application of the principles for distinguishing the various types of knowledge.	30%	CLO1
b. Coverage of the implementation with respect to the anatomical entities to be represented.	4%	CSPO1
c. Correctness and completeness of the implementation.	3%	CLO2
d. Types of queries the implementation can deal with.	3%	CLO6
e. Quality of documentation and report on insight gained.	60%	ILO2

11.3   A3. Installation of SemMedDb

- Students must download from SemMedDb (https://lhncbc.nlm.nih.gov/ii/tools/SemRep_SemMedDB_SKR.html) at least the PREDICATION and PREDICATION_AUX tables in the csv-format (NOT MySQL!). Because of the size of these tables, a stable and fast internet connection is required. Once downloaded as gz-compacted file, the files must be extracted using one or other unzipper/unpacker. Downloading requires a free UMLS-license which can be obtained through the UB-NLM gateway. Students must submit a small report on problems encountered and attempted solutions.
- Due date: prior to W8, 10am.

11.4   A4. Quality control exercise on SemMedDb

- Students will develop and implement in Prolog a quality control procedure on SemMedDb not discussed in class. Assignment to be done strictly individually. Students must document their work and reflect on decisions taken and outstanding problems.
- Due date: 2 days prior to W10, noon.
- Assessment:

Assessment criteria	Weight	Assessed SLOs	
a. Correctness and completeness of the implementation.	20%	CLO2 CSPO1	CLO4 CSPO2
b. Quality of documentation and report on insight gained.	80%	CLO3 CSPO1 CSPO3 ILO6	CLO8 CSPO2 ILO1

11.5 A5. Requirements specification for final project

- Students will write the first version of the requirements specifications for the final project application they intend to implement. These requirements should contain a clear description of what the application aims to achieve, the intended input and output, the desired quality/accuracy/performance, and the methods to assess the quality.
- Due date: 2 days prior to W12, noon.
- Assessment:

Assessment criteria	Assessed SLOs
Clarity and completeness of the description.	CLO5

11.6 A6. Final project report

- The final report must consist of the following components:
  - An improved version of the requirements specification (A5) which takes into account the discussion about it during W12.
  - A well-documented Prolog implementation of the student's final project, delivered as separate and executable Prolog-code.
  - A discussion on the design choices made during the implementation.
  - Lessons learned.
  - A summary PowerPoint presentation for W14.
- Due date: 2 days prior to W14, noon.
- Assessment:

Assessment criteria	Weight	Assessed SLOs	
a. Clarity and soundness of the individual components	80%	CLO8	CSPO3
		PLO1	PLO3
		PLO5	ILO1
		ILO2	ILO6
b. Successful execution of the software.	20%	CLO5	CLO6
		CLO7	CSPO2
		PLO3	PLO5

11.7 Final exam

The final exam will be in person with all students participating at the same time. They will be given a relatively small Prolog program consisting of a knowledge base and routines, as well as a description of what the program is intended to do. Both the knowledge base and routines will contain mistakes and omissions to the effect that the program will not run as intended. The task is to correct the mistakes and add the missing parts. Grading will be based on the following parameters:

- 50% towards the percentage of mistakes found,
- 30% towards the percentage of total mistakes corrected,
- 20% towards the corrected program running as intended.

12 COURSE MATERIALS

This course builds on the papers and electronic publications listed below, all of which are available publicly or through the UB Libraries. The required readings include:

R1. Rob Toews. To understand the future of AI, study its past. Forbes, Nov 17, 2019,07:53pm EST (https://www.forbes.com/sites/robtoews/2019/11/17/to-understand-the-future-of-ai-study-its-past/)
R2. Farzeen Imam. Logical programming languages: what should you know? (https://www.finsliqblog.com/programming-languages/programming-languages-used-for-logic-programming/)
R3. Kilicoglu H, Rosemblat G, Fiszman M, Shin D. Broad-coverage biomedical relation extraction with SemRep. BMC Bioinformatics. 2020 May 14;21(1):188. doi: 10.1186/s12859-020-3517-7. PMID: 32410573; PMCID: PMC7222583. (https://bmcbioinformatics.biomedcentral.com/articles/10.1186/s12859-020-3517-7)
R4. Li X, Peng S, Du J. Towards medical knowmetrics: representing and computing medical knowledge using semantic predications as the knowledge unit and the uncertainty as the knowledge context. Scientometrics. 2021;126(7):6225-6251. doi: 10.1007/s11192-021-03880-8. Epub 2021 Feb 14. PMID: 33612884; PMCID: PMC7882417. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7882417/).

Further useful resources:

R5.   SWI-Prolog documentation.
        (https://www.swi-prolog.org/pldoc/doc_for?object=manual)
R6.   Bratko. Prolog programming for Artificial Intelligence.

13 ATTENDANCE POLICY

Students are expected to attend **all** lectures and exercises. For religious observances, university sanctioned events, athletic commitments and family/work obligations/emergencies, absences may be granted upon request but can have an effect on the finally obtained grade (see grading policy)

For course cancellation/emergency planning, see the university website for cancellations/delays due to weather or other unforeseen events (http://emergency.buffalo.edu/campus-weather-alerts.html)

14 PROTECTION OF COURSE MATERIAL

All materials prepared and/or assigned by me for this course are for the students' educational benefit. Other than for permitted collaborative work, students may not photograph, record, reproduce, transmit, distribute, upload, sell or exchange course materials, without my prior written permission. "Course materials" include, but are not limited to, all instructor-prepared and assigned materials, such as lectures; lecture notes; discussion prompts; study aids; tests and assignments; and presentation materials such as PowerPoint slides, or transparencies; and course packets or handouts. Public distribution of such materials may also constitute copyright infringement in violation of federal or state law. Students who violate this policy will be required to complete an educational sanction about the value of intellectual property. More serious and/or repeat violations of this policy may be treated as acts of "academic dishonesty" and/or subject a student to disciplinary charges under the "Student Code of Conduct."

15 UNIVERSITY SUPPORT SERVICES

Students are often unaware of university support services available to them. For example, the Center for Excellence in Writing provides support for written work, and several tutoring centers on campus provide academic success, support and resources.

Other vital support for graduate students include counseling services and sexual violence resources. A support service section of your syllabus might include information about those. Feel free to add the following text in your syllabus as you see fit.

15.1 counseling service

As a student you may experience a range of issues that can cause barriers to learning or reduce your ability to participate in daily activities. These might include strained relationships, anxiety, high levels of stress, alcohol/drug problems, feeling down, health concerns, or unwanted sexual experiences. Counseling, Health Services and Health Promotion are here to help with these or other issues you may experience. You learn can more about these programs and services by contacting:

Counseling Services
120 Richmond Quad (North Campus), 716-645-2720
202 Michael Hall (South Campus), 716-829-5800
https://www.buffalo.edu/studentlife/who-we-are/departments/counseling.html

Health Services
Michael Hall (South Campus), 716-829-3316
https://www.buffalo.edu/studentlife/who-we-are/departments/health.html

Office of Health Promotion
114 Student Union (North Campus), 716-645-2837
https://www.buffalo.edu/studentlife/who-we-are/departments/health-promotion.html .

15.2 sexual violence

UB is committed to providing a safe learning environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic and dating violence and stalking. If you have experienced gender-based violence (intimate partner violence, attempted or completed sexual assault, harassment, coercion, stalking, etc.), UB has resources to help. This includes academic accommodations, health and counseling services, housing accommodations, helping with legal protective orders, and assistance with reporting the incident to police or other UB officials if you so choose. Please contact UB's Title IX Coordinator at 716-645-2266 for more information. For confidential assistance, you may also contact a Crisis Services Campus Advocate at 716-796-4399.

Please be aware UB faculty are mandated to report violence or harassment on the basis of sex or gender. This means that if you tell me about a situation, I will need to report it to the Office of Equity, Diversity and Inclusion. You will still have options about how the situation will be handled, including whether or not you wish to pursue a formal complaint. Please know that if you do not wish to have UB proceed with an investigation, your request will be honored unless UB's failure to act does not adequately mitigate the risk of harm to you or other members of the university community. You also have the option of speaking with trained counselors who can maintain complete confidentiality. UB's Options for Confidentially Disclosing Sexual Violence provides a full explanation of the resources

available, as well as contact information. You may call UB's Office of Equity, Diversity and Inclusion at 716-645-2266 for more information, and you have the option of calling that office anonymously if you would prefer not to disclose your identity.

16 *TECHNOLOGY RECOMMENDATIONS*

To effectively participate in this course, regardless of mode of instruction, the university recommends you have access to a Windows or Mac computer with webcam and broadband. Your best opportunity for success in the blended UB course delivery environment (in-person, hybrid and remote) will require these minimum capabilities.