Syllabus - Nucleic Acid Chemistry (Chem 425 / 625) - Winter 2023

Instructor: **Dr. Christopher J. Wilds**
Office: SP 201.13 (848-2424 x 5798)
Email: Chris.Wilds@concordia.ca

Time & Location: Tuesday and Thursday 10:15 - 11:30 AM in CC-405

Office Hours: Thursdays from 2:00 - 3:00 PM (or by appointment)

Course Description: This is an advanced undergraduate / graduate level course dealing with a number of topics pertaining to the field of nucleic acids including: Nomenclature, heterocycle and nucleoside synthesis, solid-phase synthesis, methods of purification and characterization of oligonucleotides, DNA and RNA structure, therapeutic applications of synthetic oligonucleotides (antisense, antigene and RNAi), interaction of small molecules with nucleic acids, DNA damage and repair.

Course Format: The course content will be delivered in-person in a lecture style format and reinforced through classroom discussion of articles from scholarly journals, a term test (during the scheduled course time), a term paper, student presentations (during the scheduled course time), and a final exam (scheduled during the final exam period).

Course materials: On reserve at Vanier Library (3-hour reserve):

Nucleic Acids in Chemistry and Biology (fourth edition)
G. Michael Blackburn, Martin Egli, Michael J. Gait, Jonathan K. Watts (Editors), The Royal Society of Chemistry, Cambridge (UK), 2022. (recommended)

Notes and journal articles will be supplied by the instructor and will be available through the Chem 425 / 625 Moodle website.

Grading Scheme:

	Assessment Method	**Weight**
Term Test	(in class, 1 ¼ hour, March 14)	25 %
Term Paper	(due date of March 19)	15 %
Presentation	(March 21, 23, 28 and 30 and April 4 and 6)	10 %
Participation		5 %
Final Exam	(cumulative, date TBA)	45 %

In the event of extraordinary circumstances and pursuant to the Academic Regulations, the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the changes.

If you miss the midterm exam due to a medical emergency or a death in the immediate family you must (1) email me immediately and (2) provide me with a medical certificate or death certificate within 4 days of the missed exam. If the document is valid, then the final exam will count for both. No other reason for missing the exam will be accepted.

TERM PAPER & PRESENTATION INSTRUCTIONS

Term Paper - General Instructions:

The term paper is worth 15 % of the course grade.

Each student will select a topic pertaining to the field of nucleic acid chemistry (with an emphasis on chemistry). You must also find a recent manuscript (published after January 2018) that has appeared in a peer-reviewed journal (Journal of the American Chemical Society, Nucleic Acids Research, Nature Chemistry, etc.) as an example of a recent advancement in this field (so if you have selected antisense therapeutics as a topic, you must also include in your term paper a description of a recent research article from a peer reviewed publication related to antisense). Once you have selected your topic and the manuscript, email it and set up a meeting with the course instructor in order to obtain permission for your topic (to ensure that there is no topic duplication with your colleagues or lecture content from the instructor).

FAILURE TO SELECT A TOPIC AND MEET WITH THE INSTRUCTOR BY FRIDAY, FEBRUARY 17, 2023 (BEFORE 3 PM) WILL RESULT IN A PENALTY OF 25 % FOR THE TERM PAPER – THERE WILL BE NO EXCEPTIONS! IT IS HIGHLY RECOMMENDED THAT YOU SELECT YOUR TOPIC AS SOON AS POSSIBLE.

The term paper is to be submitted by email to the instructor (chris.wilds@concordia.ca) by **11 PM on March 19, 2023**. There will be a penalty for papers not submitted on time (a reduction of 10 % of the final grade for the paper every day it is late starting at 11:01 PM on March 19, 2023).

In no case is it acceptable to plagiarize from books, journal articles, from another person's work or from web sources. Papers that contain plagiarized passages will receive a grade of zero. References should be from peer-reviewed journal articles, reviews or book chapters (no internet / web page references for the text).

Your paper should be written describing your topic, its importance / relevance to nucleic acid chemistry, any necessary background principles related to the topic and discussion of the manuscript that you have selected highlighting the experiments performed, the results obtained and a critical assessment of what advances that the work has contributed to the field. It should not be a summary of only the recent manuscript you have selected.

Term Paper - Format:

The term paper should be at a minimum 20 pages and not exceed 30 pages in length. It should be typed, 1 ½ line-spaced, with 12-point font and 1 ¼ inch margins around with page numbers on the bottom.

Include copies of the 2 or 3 most significant references (as pdf files) when submitting the term paper.

Ideas should be cited properly from peer reviewed journals and books (no internet sources). For journal articles, a suggested format is:

Smith, J.S., and Nikonowicz, E.P. (2000) *Biochemistry 39*, 5642-52.

For books:

Wimenga, S.S., Mooren, M.M.W. and Hilbers, C.W. (1993) in *NMR of Macromolecules, A Practical Approach* (Roberts, G.C.K., Ed.) pp 217-288, Oxford University Press, New York.

Term Paper - Evaluation:

The evaluation scheme for the term paper will be:

	POINTS
Originality	5
Challenge of the topic	5
Relationship to nucleic acids/chemistry	5
Overall (thorough) survey of topic / field	30
Appropriate use of figures	5
Discussion of the manuscript	10
Critical analysis of the manuscript	10
Conclusions	10
Extent of background research	5
Organization	5
Length	5
Typeset	5
TOTAL	**100**

Presentation - General Instructions:

On the dates of March 21, 23, 28 and 30 and April 4 and 6 there will be student presentations. These presentations should last approximately 20 minutes (with a few minutes afterwards for questions) on the topic of your term paper using Powerpoint. If your presentation goes beyond 23 minutes you will be penalized. You will have the opportunity to rank your preference in presentation dates. Prepare to be asked questions regarding your presentation by the instructor and your fellow classmates (part of the participation grade will be based on this - see below). You will be evaluated on the introduction and description of your topic, the organization of your presentation and its appearance, explanation of key concepts and figures used in your presentation, highlights of key results from the manuscript you have selected and a critical assessment of the advancement to the field and your responses to questions from the instructor and colleagues in class.

CLASS PARTICIPATION

Students are expected to attend the lectures, read the articles that are handed out and contribute to the discussion of these articles. It is expected that cell phones be silent and put away during the lecture.

It is expected that students attend all the presentations given by their colleagues that will be held towards the end of the course. Be prepared to ask your colleagues questions regarding their presentations.

Failure to abide by these guidelines will influence your class participation grade.

MANDATORY QUIZ AND SEMINAR

"CHEM 101": The Academic Code of Conduct: Ethical Use of Information Sources

As part of your CHEM course, you are ***required*** to i) attend a Chemistry and Biochemistry Departmental Seminar on the academic conduct code and the appropriate use of information sources and ii) pass the online quiz associated with this seminar (the passing grade for the quiz is 100%). (**Note:** this quiz is graded by the Department of Chemistry and Biochemistry, and you do not have access to it until after you have attended the seminar. Therefore, any other quiz you may have taken on the academic code of conduct does not count toward the CHEM 101 requirement.) The aim of this seminar and quiz is to clarify the academic conduct code in terms of which practices will be considered unacceptable with regards to work submitted for grading in your CHEM course. **You are only exempt from repeating the seminar and the quiz if you have done both in Winter 2018 or more recently,*** otherwise you are required to repeat both this term. This short seminar (1 hour) will be held at the following times (note that you will not be given credit if you join too late and/or leave too early):

Date (Winter 2023)	Time (EST)	Mode	Registration link
Jan. 24 (Tuesday)	21:00-22:00	Zoom	https://concordia-ca.zoom.us/meeting/register/tZUrcemqrj4tHNYUyp-gnOR8uREtmKGIyU9u
Jan. 26 (Thursday)	21:00-22:00	Zoom	https://concordia-ca.zoom.us/meeting/register/tZckf-GhqDkuHNA4TuWQ5yWQqBPGD_Ai27-l

As space for each of the Zoom seminars is limited, please **register early** for your preferred slot (copy the corresponding link above into your browser). You will **receive** a notice from Zoom with the link to the actual seminar. Then do not forget to **attend** that seminar slot on the date above!

We will take attendance at the Zoom seminar.

If you do not complete this course requirement, your final grade for the course may be lowered by one full letter grade with an incomplete (INC) notation until such time as this requirement is completed. Please refer to the undergraduate calendar (section 16.3.5) for details on removal of an incomplete notation.

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(514) 848-2424 ext. 5798 email: Chris.Wilds@concordia.ca

* You are exempt if you can locate your ID in the pdf file located on the Departmental web site (http://www.concordia.ca/content/dam/artsci/chemistry/docs/Compliance-list.pdf) and if there is no entry in the “quiz” column for you.

Plagiarism and Other Forms of Academic Dishonesty:

The Academic Code of Conduct can be found in section 17.10 of the academic calendar (http://www.concordia.ca/academics/undergraduate/calendar/current/17-10.html). Any form of unauthorized collaboration, cheating, copying or plagiarism found in this course will be reported and the appropriate sanctions applied. The mandatory seminar is a clear and fair opportunity to learn what our faculty regards as academic misconduct. Failure to take part in this learning opportunity and thus ignorance of these regulations is no excuse and will not result in a reduced sanction in any case where academic misconduct is observed.

BEHAVIOR

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the Code of Rights and Responsibilities which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

LIST OF STUDENT SERVICES

1. Access Centre for Students with Disabilities: http://www.concordia.ca/students/accessibility.html
2. Student Success Centre: http://www.concordia.ca/students/success.html
3. Counselling and Psychological Services: http://www.concordia.ca/students/counselling.html
4. Library Citation and Style Guides: https://library.concordia.ca/help/citing
5. Health Services: http://www.concordia.ca/students/health.html
6. Financial Aid and Awards: http://www.concordia.ca/offices/faao.html
7. Academic Integrity: http://www.concordia.ca/conduct/academic-integrity.html
8. Dean of Students Office: http://www.concordia.ca/offices/dean-students.html
9. International Students Office: http://www.concordia.ca/students/international.html
10. Student Hub: http://www.concordia.ca/students.html
11. Sexual Assault Resource Centre: www.concordia.ca/conduct/sexual-assault.html
12. CSU Advocacy Centre: https://www.csu.qc.ca/services/advocacy/
13. Aboriginal Student Resource Centre: http://www.concordia.ca/students/aboriginal.html

CHEM 425 / 625 SCHEDULE - WINTER 2023 Term dates: January 9 - April 18, DEADLINE TO WITHDRAW WITH TUITION REFUND = January 23, LAST DATE TO DROP CLASS (DISC) = April 18

Date	Topic	Chapters in Blackburn, Egli, Gait & Watts (4th ed)
January 10 January 12	Introduction / DNA and RNA structure	Ch. 1 p. 1-19 Ch. 2 p. 20-40, 59-64, 65-74, 77-79, 90-91
January 17 January 19 January 24	Nucleoside synthesis	Ch. 3 p. 96-103, 112-118
January 26 January 31	Oligonucleotide synthesis	Ch. 7 p. 279-304
February 2 February 7 February 9	Therapeutic applications of nucleosides and oligonucleotides	Ch. 2 p. 59-61 Ch. 3 p.154-169 Ch. 9 p. 350-382 Ch. 12 p. 511-517
February 14 February 16 February 21	Techniques applied to nucleic acids	Ch. 15 p. 1-19, 27-30, 36-37 (available online at the link below) www.rsc.org/suppdata/books/178801/9781788019040/bk9781788019040.pdf
February 23	Interactions of nucleic acids with small molecules	Ch. 11 p. 421-458 Ch. 12 p. 477-498
February 27 - March 5	**MID-TERM BREAK**	
March 7 March 9	Interactions of nucleic acids with small molecules	Ch. 11 p. 421-458 Ch. 12 p. 477-498
March 14	**TERM TEST (1 ¼ hr, 10:15 - 11:30 AM)**	
March 16	DNA damage and repair	Ch. 11 462-473
March 21	Student Presentations	
March 23	Student Presentations	
March 28	Student Presentations	
March 30	Student Presentations	
April 4	Student Presentations	
April 6	Student Presentations	
April 11	DNA / protein interactions	Ch. 13 p. 522-536, 540-541, 551-555, 572-576
April 13	Review session for the final exam	
FINAL EXAM PERIOD: April 20 - May 2		

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