NORTHWESTERN POLYTECHNIC

DEPARTMENT OF SCIENCE

COURSE OUTLINE – Fall 2022
BC2000: INTRODUCTORY BIOCHEMISTRY

3 (3-0-0) 45 Hours for 15 Weeks

Northwestern Polytechnic acknowledges that our campuses are located on Treaty 8 territory, the ancestral and present-day home to many diverse First Nations, Metis, and Inuit people. We are grateful to work, live and learn on the traditional territory of Duncan's First Nation, Horse Lake First Nation and Sturgeon Lake Cree Nation, who are the original caretakers of this land.

We acknowledge the history of this land and we are thankful for the opportunity to walk together in friendship, where we will encourage and promote positive change for present and future generations.

INSTRUCTOR: Beatrice Amar Ph.D. **PHONE: 7805392031**
OFFICE: J208 **E-MAIL: BAmar@NWPolytech.ca**
OFFICE HOURS: Wednesday and Friday: 10 a.m. - 12 p.m.

CALENDAR DESCRIPTION:

This course is an introduction to the fundamental principles of biochemistry, protein structure and function; lipids and the structure of biological membranes; nucleotides and the structure of nucleic acids; bioenergetics and the metabolism of carbohydrates, lipids and nitrogen; the integration and regulation of cellular metabolism. This course is intended for students who require a one-term introduction to the fundamental principles of biochemistry, and for students who intend to take further courses in biochemistry.

PREREQUISITE(S)/COREQUISITE: CH1010 and CH2610

REQUIRED TEXT/RESOURCE MATERIALS:

"Essential Biochemistry" (4 th Edition, 2018 or 3 rd Edition, 2014) Charlotte W. Pratt and Kathleen Cornely. John Wiley & Sons Inc. Publishers

SUPPLEMENTS:

Practice quizzes will be made available D2L course page to aid preparation for exams.

DELIVERY MODE(S):

Classes	Tuesday	10.00 a.m. – 11.20 a.m.
	Thursday	10.00 a.m. – 11.20 a.m.

COURSE OBJECTIVES:

Students will gain a deeper understanding of how biomolecules interact and support life. Emphasis will be placed on the ability to analyze and interpret primary literature related to biochemical processes and metabolic diseases.

LEARNING OUTCOMES:

Students will be able to:

1. To gain an understanding of the relationship of structure to function in biomolecules.
2. To gain a knowledge of the fundamental processes involved in energy generation and storage in living systems.
3. To understand the metabolic pathways and the regulation of biochemical pathways.
4. To develop critical thinking skills and scientific research and presentation skills.

TRANSFERABILITY:

Please consult the Alberta Transfer Guide for more information. You may check to ensure the transferability of this course at the Alberta Transfer Guide main page http://www.transferalberta.ca.

** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. **Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability**

EVALUATIONS:

Mid Term Exam I	20%
Mid Term exam II	25%
Presentation	5%
Assignments	20%
Final Exam	30%
Total	100%

GRADING CRITERIA: (The following criteria may be changed to suite the particular course/instructor)

Please note that most universities will not accept your course for transfer credit **IF** your grade is **less than C-**.

Alpha Grade	4-point Equivalent	Percentage Guidelines	Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	4.0	90-100	C+	2.3	67-69
A	4.0	85-89	C	2.0	63-66
A-	3.7	80-84	C-	1.7	60-62
B+	3.3	77-79	D+	1.3	55-59
B	3.0	73-76	D	1.0	50-54
B-	2.7	70-72	F	0.0	00-49

COURSE SCHEDULE/TENTATIVE TIMELINE:

BC2000 Fall 2022 Topic Outline &Text Readings

Topic		3rd Edition pages	4th Edition pages
1. Biological Molecules			
	Types of biomolecules	3-6	3-6
	Biopolymers	6-10	6-9
	Nucleosides and nucleotides	52-55	52-55
	Basic structure of DNA and RNA	56-61	56-61
	Functions of Nucleic acids (Central Dogma)	61-65	61-64
2. Protein Structure and Function			
	Overview	87-88	85
	Amino acids	89-91	86-90
	Peptide bonds and primary structure	91-96	90-94
	Secondary structures	96-99	94-97
	Tertiary structure and stabilization	99-104	97-101
	Protein folding & Quarternary structure	104-108	101-106
	Oxygen binding to myoglobin and haemoglobin	122-133	120-129
3. Lipids and Biological Membranes			
	Fatty acids, triacylglycerols and membrane lipids	220-227	215-222
	Lipid bilayers and membrane fluidity	227-230	222-225

	Membrane proteins	230-233	225-228
	Fluid Mosaic Model	233-234	228-229
	Passive & Active membrane transport	246-255	240-248
	4. Enzymes		
	What is an enzyme?	158-161	154-157
	Classifying enzymes	161-162	157-158
	Co-enzymes and dietary vitamins	54-55; 320-322	54-55; 312-314
	Catalytic mechanisms	162-171	158-166
	Substrate binding	171-174	166-171
	Enzyme kinetics	188-198	183-192
	Enzyme inhibition	200-209	194-200
	Allosteric enzymes	209-211	200-203
	Other *in vivo* regulatory mechanisms	211	203
	Co-enzymes and roles as electron carriers	316-317	308-309
	5. Introduction to Metabolism		
	Energy and metabolism	10-14	10-14
	Food and Fuel	308-311	301-303
	Storage and use of fuels	312-314	304-306
	Metabolic pathways and common intermediates	314-316	306-308
	Oxidation and reduction	316-317	308-309
	Overview of metabolism	318-320	310-312
	Free energy changes in metabolic reactions	323-325	314-316
	Energy currency, ATP, coupled reactions	325-330 Fig 3-3a	316-321 Fig 3-2a
	6. Glucose Metabolism		
	Introduction	290-294, 359 338-33	283-287; 349; 329
	Glycolysis	339-350	330-340
	Fates of Pyruvate	350-354	341-344
	Anaerobic exercise and the Cori Cycle	513-514	499-500
	Gluconeogenesis and Glycogen metabolism	354-359	344-349
	Pentose phosphate pathway	361-363	350-352
	Summary of glucose metabolism	363-364	352-353
	Hormonal regulation	515-518; 277-280; 522-523	501-505; 270-273; 509-510

	7. Citric Acid Cycle and Oxidative Phosphorylation		
	Introduction	370-371	362
	Conversion of pyruvate to acetyl-CoA	371-374	362-365
	Reactions of the Citric Acid Cycle	374-381	365-372
	Regulation of the Citric Acid Cycle	381-382	372-373
	Catabolism, anabolism and anapleurotic reactions	384-388	374-378
	Overview of oxidative phosphorylation	394-395	385
	Mitochondria and Electron transport chain	399-408	390-399
	Chemiosmosis	408-410	399-401
	ATP synthase	410-414	401-405
	ATP yield from aerobic catabolism of glucose	380-381	372
	8. Metabolism of Fats, Fatty Acids and Cholesterol		
	Overview of fat metabolism	Fig. 17-4	Fig. 17-4
	Transport of lipids	443-444	432-434
	TAG synthesis	463-465	452-454
	Lipases and TAG breakdown	445	435
	Degradation of fatty acids (activation & transport)	445-446	435-436
	Degradation of fatty acids (β-oxidation)	446-453	436-443
	Glyoxylate cycle	386	377
	Fatty acid synthesis	453-459	443-449
	Regulation of fatty acid metabolism	459-460	449-450
	Fat metabolism and diabetes	522-524	509-511
	Ketone bodies and ketogenesis	461-462	450-452
	Cholesterol synthesis and regulation	466-467	454-457

STUDENT RESPONSIBILITIES:

Participation in lectures, and completion of assignments are important components of this course. Regular attendance in class is strongly advised. Students who chose not to attend or complete assignments must assume the risks involved.

STATEMENT ON PLAGIARISM AND CHEATING:

Cheating and plagiarism will not be tolerated and there will be penalties. For a more precise definition of plagiarism and its consequences, refer to the Student Conduct section of the Northwestern Polytechnic Calendar at https://www.nwpolytech.ca/programs/calendar/ or the Student Rights and Responsibilities policy which can be found at https://www.nwpolytech.ca/about/administration/policies/index.html.

**Note: all Academic and Administrative policies are available on the same page.