

I. COURSE INFORMATION				
COURSE CODE	Сомр3601			
<b>COURSE TITLE</b>	BIOINFORMATICS ALGORITHMS			
OMAN QUALIFICATION	7			
FRAMEWORK (OQF) LEVEL	1			
<b>CREDIT HOURS</b>	3			
<b>CONTACT HOURS</b>	4			
<b>PRE-REQUISITES</b>	COMP2101, BIOL2101			
<b>CO-REQUISITES</b>				
EQUIVALENT COURSES				
<b>INCOMPATIBLE COURSES</b>				
	□ University Requirement		□ Universit	y Elective
	□College Requirement		🗆 College I	Elective
	Department Requirement		□ Department Elective	
COURSE CATEGORY	□ Major Requirement		🛛 Major E	Elective
	□ Specialization Requirement		🗆 Specializ	ation Elective
	$\Box$ Other (specify):			
	College: Science		Department:	Computer
COURSE OWNER			Science	
	Center:		Unit:	
<b>Delivery Mode</b>	$\Box$ Face to Face	$\boxtimes$ Ble	nded	□ Online
			⊠ Lecture/Lab	
	□ Lecture/Seminar		□ Lecture/Studio	
	□ Lecture/Tutorial		□ Lecture/Lab/Tutorial or	
COURSE TYPE			Seminar	
COURSE I YPE			□ Laborator	y (Practical)
	□ Field or Work Placement		□ Studio	
	□Seminar		🗆 Internship	)
	□ Workshop		□ Project	

	□ Thesis			$\Box$ Other (sp	ecify):	
LANGUAGE OF	English					
Course Description	This course introduces key bioinformatics concepts and their related computational techniques. A hands-on approach is adopted to discuss the underlying algorithms currently used to analyze biological data. Major topics covered include Gene and Protein Alignments, Sequence Assembly, Gene Prediction, Structure prediction, Molecular Evolution and Gene Expressions.					
	□ Augmen	ted Reality		□ Flipped C	Classroom	
<b>—</b> ———————————————————————————————————	□ Blended	Learning		Problem-	Based Lear	ming
TEACHING AND LEARNING	Discover	ry-Based Learning		□ Project-B	ased Learn	ing
SIKALEGIES	□ Student-	Led Learning		🗆 Team-Bas	sed Learnir	ıg
	U Work-Ba	ased Learning		□ Other (sp	ecify):	
	🛛 In-term e	examination(s) (2	0%)	🗆 Quizzes (	%)	□Other
ASSESSMENT COMPONENT	Homework assignments ( 20 %)		20 %)	□Project (%) (specify		(specify
AND WEIGHT	⊠ Final examination ( 40 %)			<ul> <li>☑ Practical/ Lab</li> <li>(20%)</li> <li>( %)</li> </ul>		): (%)
TEXTBOOKS AND Educational Material	<ul><li>Exploring Bioinformatics: A project-Based Approach, C. St. Clair, and J. Visick, 2nd edition (December 26, 2013)</li><li>Bioinformatics Algorithms, Compeau P. &amp; Pevzner P., Active Learning Publishers, 2018</li></ul>					
GRADING METHOD	□ A-F Scal	le	$\Box$ Pas	s/Not Pass	□ Other	(specify):
GRADING METHOD DESCRIPTION						
	Range	Letter Grade		Desc	ription	
	90 - 100	A	_ Exce	eptional perfo	ormance: A	All course
	80 - 89.9	A-	cons	istently outsta	nding man	ner
	81-85.9	B+	Verv	v Good Perfor	mance: T	he
	77 - 80.9	B	majo	majority of the course objectives		ves
A-F GRADING SCALE:	73 – 76.9	В-	achie	achieved (majority being at least two		ast two-
			third	s) and met in a	a consisten	tly
	(0.70.0		thore	ough manner.		
	68 - 72.9	C+	Sati	Satisfactory Performance: At least		At least
	04 - 0/.9	C	most	most of course objectives have been		e been
	60 - 63.9	(-	acmi	eved and met s	satistactori	у.

	55 - 59.9	D+	Minimally Acceptable Performance:
	50 - 54.9	D	The course objectives met at a
			minimally acceptable level.
	0-49.9	F	Unacceptable performance: The
			course objectives not met at a
			minimally acceptable level.
PASS/NOT PASS:			· · · · · · · · · · · · · · · · · · ·
OTHER:			

II. SEMESTER INFORMATION			
Semester/Year	Fall 2025	Section(s)	
DAY AND TIME		VENUE(S)	
COURSE COORDINATOR	Dr. Hamza ZIDOUM	COURSE TEAM	
COORDINATOR OFFICE	020	OFFICE HOURS	
COORDINATOR EXTENSION	1484	COORDINATOR EMAIL	zidoum@

III. Ат	III. ALIGNMENT OF COURSE LEARNING OUTCOMES (CLO), PROGRAM LEARNING OUTCOMES (PLO), GRADUATE ATTRIBUTES (GA), AND OMAN QUALIFICATION FRAMEWORK (OQF) CHARACTERISTICS			
	CLO	PLO	SQU Graduate Attributes	OQF Characteristics
1.	Describe the basic principles and concepts of central dogma of molecular biology	SO1	Α	1
2.	Describe bioinformatics algorithms	SO1	Α	2
3.	Utilize bioinformatics online databases and tools such as Blast.	SO1, SO2, SO6	A, B, F	1,2,6
4.	Code solutions to bioinformatics problems utilizing a high level language, such as PERL	SO1, SO2,	А, В	1,2

IV. COURSE LEARNING OUTCOMES (CLOS) AND ASSESSMENT CRITERIA AND METHODS (FOR EACH CLO)			
CLO1: Describe the basic principles and concepts of central dogma of molecular biology			
Assessme	Assessment Criteria (to achieve this objective, the student Assessment Methods		
MUST)			
A)	Understand the Genome replication	Midterm, Final Exam	
B) Solve the frequent Words Problem			
C)	Solve the Clump Finding Problem		

CLO2: De	escribe bioinformatics algorithms	
Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT	Assessment Methods
MUST)		
A)	Demonstrate a clear understanding of key	Homework, Midterm, Final Exam
	concepts related to bioinformatics algorithms,	
	including sequence alignment, gene prediction,	
	clustering, and other computational methods.	
В)	Formulate bioinformatics problems	
C)	Assess the strengths and limitations of different	
	algorithms	
CLO3: Ut	ilize bioinformatics online databases and tools suc	h as Blast (Basic Local Alignment Search
Tool) to	gain biological insight	
Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT	Assessment Methods
MUST)		
A)	Get exposed to bioinformatics databases, tools,	Homework, Lab test, Final Exam
	and resources available online. This includes	
	databases like NCBI, EMBL-EBI, and tools like	
	BLAST, Clustal, and BioPython/BioPerl libraries.	
В)	Collect adequate supporting information	
C)	Choose the appropriate program based on the	
	type of sequence and the type of comparison to	
	perform.	
CLO4: Code solutions to bioinformatics problems utilizing a high level language, such as PERL		
Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT	Assessment Methods
MUST)		
A)	Acquire a solid understanding of programming	Homework, Lab test
	fundamentals by learning a high-level language	
	such as Python, Perl, or R.	
В)	Select the appropriate algorithms	
C)	Evaluate the program performance	
CLO5:		
Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT	Assessment Methods
MUST)		
A)		
В)		
C)		

V. COURSE CONTENT AND SCHEDULE				
WEEK	LECTURE S#	<b>TOPICS/ SUBJECTS</b>	READINGS/ CHAPTERS	REMARKS (e.g., ASSESSMENTS)
1	1, 2	Exploring Bioinformatics : Bioinformatics and Genomic Data	Chapter 1	Homework, Midterm, Final
2	1, 2	Computational approach to biological problems : Computational Manipulation of DNA	Chapter 1	Homework, Midterm, Final
3	1, 2	The Central Dogma: Exploring Genetic Disease	Chapter 2	Homework, Midterm, Final
4	1, 2	Computational approaches to genes [1]	Chapter 3	Homework, Midterm, Lab test, Final
5	1, 2	Bioinformatics solutions: Aligning Genes	Chapter 3	Homework, Midterm, Lab test, Final
6	1, 2	Bio-background: Gene transfer and similarity, Antibiotic resistance	Chapter 4	Homework, Midterm, Lab test, Final
7	1, 2	Assembling the human genome	Chapter 5	Homework, Midterm, Lab test, Final
8	1, 2	Bioinformatics solutions: Sequence assembly [1]	Chapter 5	Homework, Lab test, Final
9	1, 2	Bio-background: Sequencing DNA, Sequencing complex genome	Chapter 5	Homework, Lab test, Final
10	1, 2	Structure prediction	Chapter 7	Homework, Lab test, Final
11	1, 2	Bioinformatics solutions: RNA structure	Chapter 7	Homework, Lab test, Final
12	1, 2	Bio-background: Nucleic acid folding	Chapter 7	Homework, Lab test, Final
13	1, 2	Gene Expression	Chapter 9	Homework, Final
14	1, 2	Bioinformatics solutions: Microarrays	Chapter 9	Final
15	1	Revision	-	-

### VI. ADDITIONAL INFORMATION (e.g., RUBRICS, etc.)

#### Course Assessment Plan:

Item	Date Out	Due Date	Weights
Homework Assignment 1	Week 3		==== 5%
Homework Assignment 2	Week 5	Week 7	5%
Midterm Exam	Week 9	Week 9	20%
Homework Assignment 3	Week 9	Week 11	5%
Homework Assignment 4	Week 11	Week 13	5%
Lab test	-	Week 14	20%
Final Exam	As per SIS website		40%

#### DEPARTMENT'S LATE SUBMISSION POLICY:

(A) 1-24 HOURS: 25% OF THE MARK WILL BE DEDUCTED.

(B) > 24 HOURS: NOT ACCEPTED.

### DEPARTMENT'S POLICY FOR DEALING WITH CHEATING:

IT IS ESSENTIAL THAT EACH STUDENT SOLVES ALL PROGRAMMING ASSIGNMENTS, LAB TESTS AND EXAMS INDIVIDUALLY UNLESS INSTRUCTED OTHERWISE, E.G., FOR GROUP PROJECTS. COPYING, PLAGIARISM, COLLUSION, SWITCHING, AND FALSIFICATION ARE VIOLATIONS OF THE UNIVERSITY ACADEMIC REGULATIONS. STUDENTS INVOLVED IN SUCH ACTS WILL BE SEVERELY PENALIZED. THE DEPARTMENT HAS ADOPTED A FIRM POLICY ON THIS ISSUE. A ZERO MARK WILL BE ASSIGNED THE FIRST TIME A STUDENT IS CAUGHT INVOLVED IN COPYING AND HIS/HER NAME WILL BE ADDED TO A WATCH LIST MAINTAINED BY THE HEAD OF DEPARTMENT. FURTHER REPEATED INVOLVEMENTS IN COPYING WILL CAUSE THE STUDENT TO GET AN F GRADE IN THAT COURSE. THIS IS IN LINE WITH THE UNIVERSITY ACADEMIC REGULATIONS.

#### **VII. STUDENTS RESPONSIBILITIES**

It is the student's responsibility to know and comply with all University Academic Regulations relevant to participation in this course. These regulations specifically include attendance requirements and student academic code of conduct.

Academic Integrity	The University expects the students to approach their academic endeavors with the highest academic integrity. Please refer to the <b>Undergraduate Academic Regulations</b> .
ADD AND DROP	Students who wish to drop or add the course should review the <b>Undergraduate</b> Academic Regulations.
ATTENDANCE	Sultan Qaboos University has a clear requirement for students to attend courses, detailed in the <b>Undergraduate Academic Regulations</b> .
Assessment and Grading	To ensure the provision of a sound and fair assessment and grading, please review the <b>Undergraduate Academic Regulations</b> .

GRADE APPEAL	Students who wish to appeal their grades should review the Undergraduate Academic Regulations.
CLASSROOM POLICIES	Students are expected to dress professionally during class time as required by the University. Use of phones or any other electronic devices in the classroom during class time is strictly prohibited. Unauthorized use may lead to faculty member confiscation of the device for the remainder of the class. Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. A student responsible for disruptive behavior may be required to leave the class.
LATE AND MAKE-UP Work	Students are required to meet the course objectives by submitting coursework no later than the assigned due date. Students may be allowed to submit late work if approved by the course coordinator. Assignments submitted after the due date may be penalized.
Missed Evaluations	All quizzes, tests, clinical evaluations, and exams must be completed by the date they are assigned. If a quiz, test, or exam is missed due to a documented emergency situation (e.g., medical emergency, death in the immediate family), it is the student's responsibility to contact the instructor.
Other	

## **Course Outline Appendix**

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### 1. **PROGRAM LEARNING OUTCOMES**

**SO1.** Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

**SO2.** Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

**SO3.** Communicate effectively in a variety of professional contexts.

**SO4.** Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

**SO5.** Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

**SO6.** Apply computer science theory and software development fundamentals to produce computing-based solutions.

# 2. SQU Graduate Attributes and Competencies for Undergraduate Studies

GRADUATE ATTRIBUTES	GRADUATE COMPETENCIES FOR UNDERGRADUATE Studies
<b>A. Cognitive Capabilities:</b> The graduate has sufficient general and specialized theoretical knowledge that enables him/her to deal well with his/her specialty and other related fields.	1. Demonstrates familiarity and works with advanced specialized knowledge in the area of specialization.
	<ol> <li>Demonstrates a general understanding of the relationship of advanced specialized knowledge with knowledge in other relevant professional fields and aspects.</li> </ol>
	3. Demonstrates a comprehensive understanding of the theories, principles, and methods used in his/her specialty, and how to create and apply new knowledge.
	4. Demonstrates general knowledge of the legal environment and necessary relevant regulatory

		frameworks.
	5.	Shows awareness of contemporary literature and
		research.
	1.	Applies concepts, theories, and investigative methods to
		synthesize and interpret information to evaluate
B. Skill and Professional Capability:		conclusions.
The graduate has sufficient skill and	2.	Applies appropriate research methods and techniques and
practical experience that enables		employs digital knowledge
him/her to perform all tasks related to	3.	Evaluates and critiques information independently
the specialization and other related	4.	Uses cognitive and technical skills to analyze complex
fields.		issues and develop appropriate solutions.
	5.	Initiates new ideas or processes in the professional,
		educational or research context.
C. Effective Communication: The	1.	Explains, presents, and adapts information to suit the
graduate has the ability to communicate		recipients.
effectively with others to achieve the	2	Employs appropriate information and communication
desired results	2.	technology to collect and analyze information
D. Autonomy and Leadership: The	1.	Performs advanced professional activities independently.
graduate has the ability to lead, make	2.	Demonstrates leadership skills.
decisions and take responsibility for	3.	Takes professional responsibility.
decisions.	4.	Assumes full accountability for the tasks and their output.
	1.	Manages time and other resources assigned to
E. Responsibility and Commitment:		accomplishing tasks effectively and responsibly.
The graduate appreciates the	2.	Demonstrates effective practices when working in teams.
importance of available resources and	3.	Demonstrates advanced levels of understanding of values
deals with them effectively and is		and ethics relevant to the specialization, profession and
committed to the ethics of the		local and international society and promotes them among
profession and society.		others.
	4.	Works within the professional, institutional, and

		specialization guiding frameworks and strategic plans.
	5.	Interacts with community affairs positively and preserves national identity.
<b>F. Development and Innovation:</b> The graduate has a passion for development and innovation in the field of specialization.	1.	Demonstrates the ability to independently manage
		learning tasks, with an awareness of how to develop and apply new knowledge.
	2.	Utilizes specialized knowledge and skills for entrepreneurship.
	3.	Utilizes creative and innovative skills in the field of specialization.

## **3. OQF** Characteristics

- 1. Knowledge
- 2. Skills
- 3. Communication, Numeracy, and Information and Communication Technology Skills.
- 4. Autonomy and Responsibility
- 5. Employability and Values
- 6. Learning to learn