

# University of Information Technology and Communications (UoITC)



جامعة تكنولوجيا المعلومات  
والاتصالات

*First Cycle – Bachelor's degree (B.Sc.) in  
Bioinformatics*

بكالوريوس في المعلوماتية الاحيائية

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## 1. Mission & Vision Statement

### ***Vision Statement***

Our vision is to produce highly skilled professionals who are at the forefront of innovation and drive positive change in society through the applications of bioinformatics.

### ***Mission Statement***

Our mission is to contribute to the field of bioinformatics by providing extensive education and conducting pioneering research. We are committed to empowering students with the necessary knowledge and abilities to effectively analyze and understand intricate biological and medical data. By promoting innovation and cultivating critical thinking, we strive to make significant advancements in the field.

## 2. Program Specification

|                        |                       |                              |           |
|------------------------|-----------------------|------------------------------|-----------|
| <b>Programme code:</b> | BSc-BI                | <b>ECTS</b>                  | 240       |
| <b>Duration:</b>       | 4 levels, 8 Semesters | <b>Method of Attendance:</b> | Full Time |

Bioinformatics is a multidisciplinary field that combines biology, computer science, mathematics, and statistics to analyze and interpret biological data. It involves the development and application of computational tools and techniques to gather, store, organize, analyze, and visualize biological information. Bioinformatics plays a crucial role in various areas of biological research, including genomics, proteomics, structural biology, evolutionary

biology, and systems biology. By leveraging computational methods and algorithms, bioinformatics enables scientists to make sense of large-scale biological datasets and gain insights into biological processes and phenomena. The program specification entails a comprehensive curriculum designed to equip students with the necessary skills and knowledge in bioinformatics.

This program offers students a comprehensive understanding of bioinformatics, equipping them with a diverse range of knowledge and skills. At the foundational levels, students gain a solid understanding of biology, mathematics, and computer science fundamentals. They develop essential programming skills and are introduced to bioinformatics, providing them with a strong foundation for subsequent levels.

Furthermore, students will be introduced to advanced biology topics that serve as a foundation for genetics and genomic science in subsequent levels. They will actively participate in practical modules focused on enhancing their programming and data analysis skills. Through these modules, they will gain valuable hands-on experience in working with complex biological data. Moreover, a wide range of modules will be offered, aligning with the core objective of bioinformatics to explore and utilize biological data through the application of bioinformatics tools and software.

As they progress, students learn more about advanced biology subjects like genetics, genomics, and molecular biology. They also acquire practical skills in programming, data analysis, and working with complex biological data. The curriculum covers key areas such as artificial intelligence, medical image processing, computational biology, and big data in biology. Students graduate with a well-rounded understanding of bioinformatics, ready to contribute to the field and propose innovative solutions to medical and biological challenges.

To support students throughout their studies, a variety of workshops and guidance will be available. These workshops are designed to help students become familiar with the program structure and different learning methods, ensuring they are well-prepared for their academic journey. As students advance to the final levels, they will have access to specialized workshops aimed at enhancing their proficiency in writing project reports, presentations, and self-marketing skills. These workshops are designed to equip students with the necessary tools and knowledge to effectively communicate their ideas. The program ensures that students are thoroughly prepared and confident in key areas crucial for their academic and professional growth.

### **3. Program Objectives**

1. Develop proficiency in programming languages (such as Python and Matlab) to manipulate and analyze biological data effectively.
2. Gain a solid understanding of bioinformatics principles, including the retrieval, management, and analysis of biological data from various databases and formats.
3. Acquire data science skills to preprocess, clean, visualize, and analyze biological datasets using statistical and machine learning techniques.
4. Apply programming and data science knowledge to solve specific biological problems, such as gene expression analysis, sequence alignment, or network analysis.
5. Cultivate critical thinking and problem-solving abilities to extract meaningful insights and knowledge from complex biological datasets.
6. Develop a comprehensive understanding of genes, their structures, functions, and regulatory mechanisms, and apply bioinformatics techniques to study gene expression, variant analysis, and functional annotation.
7. Preparing graduates who are aware of the importance of self-learning to advance to their professional, scientific, and ethical lives.

## 4. Student Learning Outcomes

Through successfully completing the BSc in Bioinformatics program, students should be able to:

1. **Fundamental Knowledge:** Acquire a comprehensive understanding of the basic principles and concepts in biology, computer science, and mathematics, providing a strong foundation for bioinformatics studies.
2. **Computational Proficiency:** Develop a deep understanding of computer techniques and apply them effectively to diverse biological information, enabling the analysis and interpretation of complex datasets in bioinformatics.
3. **Data Extraction and Analysis:** Utilize a combination of computer science, biology, and statistics tools and techniques to extract valuable knowledge from complex biological and medical datasets, contributing to advancements in bioinformatics research and applications.
4. **Molecular Biology and Genetics:** Gain proficiency in the language and terminology of molecular biology, genetics, and bioinformatics, facilitating effective communication and collaboration with experts in these fields.
5. **Awareness of Emerging Trends:** Stay abreast of the latest advances and challenges in bioinformatics, fostering a comprehensive understanding of the evolving landscape of the field and the potential implications for research and industry.

6. **Practical Skills Demonstration:** Exhibit essential practical skills, including computer programming, artificial intelligence (AI), analytical reasoning, problem-solving, and critical reading of scientific literature, empowering students to effectively navigate and contribute to bioinformatics projects.
7. **Research Project Management:** Plan, execute, and communicate the findings of a small-scale research project both verbally and in writing. Demonstrate independent thinking, organizational skills, and the ability to apply research methodologies, showcasing competence in conducting scientific investigations within the realm of bioinformatics.
8. **Ethical and Responsible Conduct:** Uphold ethical principles in bioinformatics research and practice. Prioritize integrity, confidentiality, and privacy when handling sensitive biological data. Promote responsible data management and ethical considerations within the field of bioinformatics.

## 5. Academic Staff

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## 6. Credits, Grading and GPA

## Credits

The University of Information Technology and Communications follows the Bologna Process and uses the European Credit Transfer System (ECTS) credit system. The degree program consists of 240 ECTS, with 30 ECTS per semester. Each ECTS represents 25 hours of student workload, including both structured and unstructured tasks.

## Grading

Before the evaluation, the results are divided into two subgroups: pass and fail. Therefore, the results are independent of the students who failed a course. The grading system is defined as follows:

| GRADING SCHEME<br>مخطط الدرجات   |                  |                     |           |                                       |
|--|------------------|---------------------|-----------|---------------------------------------|
| Group  | Grade            | التقدير             | Marks (%) | Definition                            |
| <b>Success Group<br/>(50 - 100)</b>  | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|  | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|  | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|  | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|  | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| <b>Fail Group<br/>(0 - 49)</b>   | FX – Fail        | راسب - قيد المعالجة | (45-49)   | More work required but credit awarded |
|  | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
| <b>Note:</b>   |                  |                     |           |                                       |
| Number Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |           |                                       |

## Calculation of the Cumulative Grade Point Average (CGPA)

The CGPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

CGPA of a 4-year B.Sc. degree:

$$\text{CGPA} = [ (1^{\text{st}} \text{ module score} \times \text{ECTS}) + (2^{\text{nd}} \text{ module score} \times \text{ECTS}) + \dots ] / 240$$

## 7. Curriculum/Modules

**Semester 1 | 30 ECTS | 1 ECTS = 25 hrs**

| Code   | Module                     | SSW<br>L | USSWL | ECTS | Type | Pre-request |
|--------|----------------------------|----------|-------|------|------|-------------|
| BMI111 | Biology                    | 63       | 87    | 6.00 | C    | /           |
| BMI112 | Computer Programming I     | 63       | 87    | 6.00 | B    | /           |
| BID111 | Mathematics I              | 78       | 72    | 6.00 | B    | /           |
| BID112 | General Chemistry          | 78       | 72    | 6.00 | B    | /           |
| BMI113 | Computer Fundamentals      | 63       | 37    | 4.00 | B    | /           |
| HRD111 | Human Rights and Democracy | 33       | 17    | 2.00 | S    | /           |

**Semester 2 | 30 ECTS | 1 ECTS = 25 hrs**

| Code   | Module                         | SSW<br>L | USSWL | ECTS | Type | Pre-request |
|--------|--------------------------------|----------|-------|------|------|-------------|
| ENG121 | English I                      | 33       | 17    | 2.00 | S    | /           |
| BID121 | Mathematics II                 | 78       | 97    | 7.00 | B    | BID111      |
| BMI121 | Computer Programming II        | 63       | 87    | 6.00 | B    | BMI112      |
| BID122 | Introduction to bioinformatics | 63       | 112   | 7.00 | C    | /           |
| BID123 | Biophysics                     | 63       | 87    | 6.00 | B    | BID112      |
| ARA121 | Arabic                         | 33       | 17    | 2.00 | S    | /           |

**Semester 3 | 30 ECTS | 1 ECTS = 25 hrs**

| Code   | Module                           | SSWL | USSWL | ECTS | Type | Pre-request |
|--------|----------------------------------|------|-------|------|------|-------------|
| BMI211 | Object Oriented Programming      | 63   | 87    | 6.00 | C    | BMI121      |
| BID211 | Applied Bioinformatics           | 63   | 62    | 5.00 | C    | BID122      |
| BMI212 | Data Structures                  | 63   | 87    | 6.00 | C    | BMI121      |
| BID212 | Fundamental of Organic Chemistry | 63   | 37    | 4.00 | C    | BID112      |
| BID213 | Microbiology                     | 63   | 37    | 4.00 | B    | BMI111      |
| BMI213 | Discrete Mathematics             | 33   | 42    | 3.00 | B    | BID121      |
| BPC211 | Baath Party Crimes               | 33   | 17    | 2.00 | S    | /           |

**Semester 4 | 30 ECTS | 1 ECTS = 25 hrs**

| Code | Module | SSW | USSWL | ECTS | Type | Pre-request |
|------|--------|-----|-------|------|------|-------------|
|------|--------|-----|-------|------|------|-------------|



|        |                                 |    |    |      |   |                   |
|--------|---------------------------------|----|----|------|---|-------------------|
|        |                                 | L  |    |      |   |                   |
| ENG221 | English II                      | 33 | 17 | 2.00 | S | ENG121            |
| BID221 | Bioinformatics Programming      | 63 | 87 | 6.00 | C | BMI121            |
| BID222 | Fundamentals of Biochemistry    | 63 | 62 | 5.00 | C | BID212            |
| BID223 | Biostatistics                   | 63 | 87 | 6.00 | B | BID121            |
| BID224 | Immunoinformatics               | 63 | 62 | 5.00 | C | BMI111,<br>BID211 |
| BID225 | Data analysis and visualization | 63 | 87 | 6.00 | C | BMI212,<br>BMI211 |

**Semester 5 | 30 ECTS | 1 ECTS = 25 hrs**

| Code   | Module                               | SSW<br>L | USSWL | ECTS | Type | Pre-request       |
|--------|--------------------------------------|----------|-------|------|------|-------------------|
| BID311 | Bioinformatics Algorithms            | 64       | 61    | 5.00 | C    | BID221            |
| BID312 | Numerical Methods for Bioinformatics | 64       | 61    | 5.00 | B    | BMI213            |
| BID313 | Genetics                             | 64       | 61    | 5.00 | C    | BMI111            |
| BID314 | Database Management Systems          | 64       | 61    | 5.00 | C    | BID225            |
| BMI311 | Artificial Intelligence              | 64       | 61    | 5.00 | C    | BID223,<br>BID225 |
| BMI312 | Image Processing                     | 64       | 61    | 5.00 | C    | BID225            |

**Semester 6 | 30 ECTS | 1 ECTS = 25 hrs**

| Code   | Module                              | SSW<br>L | USSWL | ECTS | Type | Pre-request       |
|--------|-------------------------------------|----------|-------|------|------|-------------------|
| BMI321 | Web Development                     | 64       | 61    | 5.00 | B    | BMI121            |
| DSE101 | Data Science Ethics                 | 32       | 68    | 4.00 | S    | /                 |
| BID321 | Pattern Discovery in Bioinformatics | 64       | 86    | 6.00 | C    | BMI312,<br>BID311 |
| BID322 | Molecular Biology and Genomics      | 64       | 61    | 5.00 | C    | BID313            |
| BMI322 | Machine Learning                    | 64       | 61    | 5.00 | C    | BMI311            |
| BMI323 | Computer Vision                     | 64       | 61    | 5.00 | C    | BMI312            |

**Semester 7 | 30 ECTS | 1 ECTS = 25 hrs**

| Code   | Module                     | SSW<br>L | USSWL | ECTS | Type | Pre-request |
|--------|----------------------------|----------|-------|------|------|-------------|
| BID411 | Software Engineering       | 64       | 61    | 5.00 | B    | BMI321      |
| BID412 | Artificial Neural Networks | 64       | 61    | 5.00 | C    | BMI311      |
| BID413 | Human Diseases             | 64       | 61    | 5.00 | C    | BID322      |
| BMI412 | Data Mining                | 64       | 61    | 5.00 | C    | BID321      |
| BMI411 | Cloud Computing            | 64       | 61    | 5.00 | E    | BMI321      |
| BMI410 | Project I                  | 32       | 93    | 5.00 | C    | /           |

**Semester 8 | 30 ECTS | 1 ECTS = 25 hrs**

| Code   | Module                       | SSW<br>L | USSWL | ECTS | Type | Pre-request       |
|--------|------------------------------|----------|-------|------|------|-------------------|
| BID421 | Computer-Aided Drug Design   | 64       | 61    | 5.00 | C    | BID211,<br>BID212 |
| BID422 | Convolutional Neural Network | 64       | 61    | 5.00 | C    | BID412            |
| BMI422 | Information Security         | 64       | 61    | 5.00 | C    | BID121            |
| BID423 | Computational Biology        | 64       | 61    | 5.00 | C    | BID123,<br>BID211 |
| BMI421 | Big Data Analytics           | 64       | 61    | 5.00 | E    | BMI411            |
| BMI420 | Project II                   | 32       | 93    | 5.00 | C    | BMI410            |

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