



الجمهورية اليمنية
وزارة التعليم العالي والبحث العلمي
جامعة صنعاء
كلية الطب البيطري

Course Specification of Biochemistry

| I. Course Identification and General Information: | | | | | | |
|---|--|---|-----------|----------|---------|-------|
| 1 | Course Title: | Biochemistry | | | | |
| 2 | Course Number & Code: | PH241 | | | | |
| 3 | Credit hours: | C.H | | | | Total |
| | | Theoretical | Practical | Training | Seminar | |
| | | 3 | 1 | | 4 | |
| 4 | Study level/ semester at which this course is offered: | Second Year - First Semester | | | | |
| 5 | Pre –requisite (if any): | FR114 | | | | |
| 6 | Co –requisite (if any): | None | | | | |
| 7 | Program (s) in which the course is offered: | Bachelor of Veterinary Medicine | | | | |
| 8 | Language of teaching the course: | English – Arabic | | | | |
| 9 | Location of teaching the course: | Faculty of Veterinary Medicine Building | | | | |
| 10 | Prepared by: | Prof. Maher Ali Ahmed Al-Maqtari | | | | |
| 11 | Date of approval: | | | | | |

II. Course description:

عميد مركز التطوير

عميد الكلية

نائب العميد لشئون الجودة

الموصف

رئيس الجامعة

و ضمان الجودة
أ.د. هدى العماد

د. عبدالرؤف الشوكاني

د. عبدالرقيب الشامي

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The course explores the basic principles of biochemistry by providing a basic understanding of the scientific basis of life processes. It addresses the classification, molecules, and chemical properties of major biomolecules such as carbohydrates, fats, proteins, nucleic acids and the enzyme with an emphasis on their biological importance in animals. It also covers metabolic pathways and pH regulation of biological fluids by insulators. At the end of the course, students can demonstrate knowledge of the chemical processes that occur in living organisms.

III. Intended learning outcomes (ILOs) of the course:

(A) Knowledge and Understanding:

Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in:
Knowledge and Understanding.

| Program Intended Learning Outcomes (Sub- PILOs) in: Knowledge and Understanding | | Course Intended Learning Outcomes (CILOs) in: Knowledge and Understanding | |
|---|---|---|--|
| After completing this program, students will be able to: | | After completing this course, students will be able to: | |
| A1- | Demonstrate a sound knowledge and understanding of concepts and principles of general culture, basic science, and that support veterinary medicine. | a1- | Explains the principles and purposes of the different biochemical and biological processes of composition in humans and animals |
| A2- | Clarifies basic concepts, principles, and theories related to animal production, animal health and nutrition, behavior management, breeding and care that is related to animal ethical codes. | a2- | Identifies the structure and functions of the biomolecular compounds present in living cells and their relationship to animal production |

Teaching And Assessment Methods For Achieving Learning Outcomes:

Alignment of Learning Outcomes of Knowledge and Understanding to Teaching and Assessment Methods:

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| Course Intended Learning Outcomes (CILOs) in Knowledge and Understanding | | Teaching strategies/methods to be used | Methods of assessment |
|--|--|--|--|
| completing this course, students will be able to: | | Lectures, discussion, practical presentation and simulation method, self-learning, cooperatives learning, lab work | Tasks and assignments Quiz 1 &2, Midterm exam, final exam |
| a1- | Explains the principles and purposes of the different biochemical and biological processes of composition in humans and animals | | |
| a2- | Identifies the structure and functions of the biomolecular compounds present in living cells and their relationship to animal production | | |

(B) Intellectual Skills:

Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **Intellectual Skills**

| Program Intended Learning Outcomes (Sub-PILOs) in Intellectual skills | | Course Intended Learning Outcomes (CILOs) in Intellectual Skills | |
|---|---|--|--|
| After completing this program, students will be able to: | | After completing this course, students will be able to: | |
| B1- | Competently practices analytical and critical thinking skills in studying and assessing health problems and reading the results of animal medical examinations that is related to sciences. | b1- | Compares many concepts related to living catalytic matter found in humans and animals |
| B2- | Predicts an appropriate medical diagnosis for the most common disease states through analysis of clinical story data and the results of medical examinations of a sick animal. | b2- | Explains the results of chemical analysis of biomolecules and enzymes quantitatively and descriptively to diagnose diseases prevalent in animals |

Teaching And Assessment Methods For Achieving Learning Outcomes:

Alignment of Learning Outcomes of Intellectual Skills to Teaching Methods and Assessment Methods:

| Course Intended Learning Outcomes (CILOs) in Intellectual Skills. | Teaching strategies/methods to be used | Methods of assessment |
|---|--|-----------------------|
| After completing this course, students will be able to: | Lectures, discussion, practical presentation and simulation method, self-learning, cooperatives learning, lab work | Tasks and assignments |

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| | | | |
|-----|--|--|-------------------------------|
| b1- | Compares many concepts related to living and catalytic matter found in humans and animals | practical presentation and simulation method, self-learning, cooperatives learning, lab work | Quiz 1 &2, Midterm final exam |
| b2- | Explains the results of chemical analysis of biomolecules and enzymes quantitatively and descriptively to diagnose diseases prevalent in animals | | |

(C) Professional and Practical Skills:

Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **Professional and Practical Skills**

| Program Intended Learning Outcomes (Sub-PILOs) in Professional and Practical Skills | | Course Intended Learning Outcomes (CILOs) in Professional and Practical Skills | |
|---|---|--|--|
| After completing this program, students will be able to: | | After completing this course, students will be able to: | |
| C1- | Accurately records a comprehensive pathological story of a sick animal including information on healthy behavior and the necessary checks. | c1- | Employs the physical and chemical properties of the biomolecules and enzymes to perform the necessary tests |
| C2- | Practices practical, diagnostic, clinical and research skills, including the collection of samples in various fields of veterinary medicine and related sciences, in a safe and effective manner, considering the ethics of the profession. | c2- | Applies the basic principles of metabolism of biomolecules in identifying the different pathways in metabolism in humans and animals |

Teaching And Assessment Methods For Achieving Learning Outcomes:

Alignment of Learning Outcomes of Professional and Practical Skills to Teaching and Assessment Methods:

| Course Intended Learning Outcomes (CILOs) in Professional and Practical Skills | | Teaching strategies/methods to be used | Methods of assessment |
|--|--|--|--|
| After completing this course, students will be able to: | | Lectures, discussion, practical presentation and simulation method, self-learning, cooperatives learning, lab work | Tasks and assignments Quiz 1 &2, Midterm exam, final exam |
| c1- | Employs the physical and chemical properties of the biomolecules and enzymes to perform the necessary tests | | |
| c2- | Applies the basic principles of metabolism of biomolecules in identifying the different pathways in metabolism in humans and animals | | |

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(D) General / Transferable Skills:

Alignment of Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **General / Transferable skills**

| Program Intended Learning Outcomes (PILOs) in General / Transferable skills | | Course Intended Learning Outcomes (CILOs) in General / Transferable skills | |
|---|--|--|--|
| After completing this program, students will be able to: | | After completing this course, students will be able to: | |
| D1- | Communicates effectively with Professional colleagues and animal owners and expresses his ideas clearly and objectively. | d1- | Collaborates with other students to engage in teamwork, group discussion, and problem solving. |
| D2- | Develops his scientific, professional and research capabilities and follow what is emerging in his field of specialization and using computer applications and information and communication technology. | d2- | Contributes actively using modern technology. |

Teaching And Assessment Methods For Achieving Learning Outcomes

Alignment of Learning Outcomes of General and Transferable skills to Teaching and Assessment Methods

| Course Intended Learning Outcomes (CILOs) in General and Transferable Skills | | Teaching strategies/methods to be used | Methods of assessment |
|--|---|--|--|
| After completing this course, students will be able to: | | Lectures, discussion, practical presentation and simulation method, self-learning, cooperatives learning, lab work | Tasks and assignments, Quiz 1 &2, exam, final exam |
| d1- | Collaborates with other students to engage in teamwork, group discussion, and problem solving | | |
| d2- | Contributes actively using modern technology | | |

IV. Course Content:

1 – Course Topics/Items:

a – Theoretical Aspect

| Order | Topic List / Units | CILOs (symbols) | Sub-topic List | Number of weeks | Contact hours |
|-------|--|-----------------|--|-----------------|---------------|
| 1 | Introduction to the principles of biochemistry | a1,a2 | Definition of biochemistry, properties and functions of living | 1 | 3 |

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| | | | | | |
|---|---------------|-------------|--|---|---|
| | | | cells, water and solutions Types of biomolecules Bioenergy. Edited and transmitted | | |
| 2 | Carbohydrates | a1,a2,b1,b2 | Definition, importance and classification of carbohydrates Optical activity of polysaccharides, their straight and annular synthesis (Fischer-Hort summer), the glycoside association, and their chemical composition Monosaccharides (glucose and fructose) Binary sugars (maltose, lactose and sucrose) Polysaccharides (halalornic acid and heparin) derivative monosaccharides and their biological importance) Carbohydrate metabolism and bioenergy production (glycolysis, carbis cycle, glucose | 3 | 9 |

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| | | | | | |
|---|------------------------|-------------------|--|---|---|
| | | | building, hexose monofosphate pathway, glycogen building) | | |
| 3 | Amino acids (proteins) | a1,a2,b1,b2 | General properties of amino acids and their types and peptide bond Proteins define their functions and classification Structural structure of proteins Protein metabolism and bioenergy production | 1 | 3 |
| 4 | Fats | a1,a2,b1,b2,c1,c2 | <ul style="list-style-type: none">• Classification of fats and their properties• Fatty acids and their types, the steroid bond and the chemical composition of fats• Phosphorous fats and steroids (cholesterol)• Fat metabolism and bioenergy production | 2 | 6 |

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| | | | | | |
|---|--|--|--|---|---|
| 5 | Nucleic acids | a1,a2,b1,b2,c1, c2 | Chemical nature and synthesis of nucleotides and nucleosides Nitrogenic bases and RNA & DNA, chemically and enzymatically degraded | 1 | 6 |
| 6 | Introduction to enzymes | a1, a2, b1, b2, c1, c2, d1 | <ul style="list-style-type: none">• Definition its properties• functions Co-enzymes | 1 | 3 |
| 7 | Properties, naming and classification of enzymes | a1, a2, b1, b2, c1, c2, c3, d1, d2 | <ul style="list-style-type: none">• Enzyme concentration and substrate• the active site of the enzyme• enzyme specificity• saturation of the active site of the enzyme and inhibitors• International designation of the Union of Biochemistry• Common label• The division of enzymes | 3 | 9 |

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|--|---|------------------------------------|--|-----------|-----------|
| | | | depending on the type of reaction that stimulates it into six main classes: | | |
| 8 | kinetics of enzyme reactions and diagnostic enzymes | a1, a2, b1, b2, c1, c2, c3, d1, d2 | derivation of the Michael Menten equation for the enzymes • Its applications in enzyme kinetics and disease diagnosis | 2 | 6 |
| Number of Weeks /and Units Per Semester | | | | 14 | 42 |

| b- Training Aspect: | | | | |
|----------------------------|---|----------------------------|-----------------|---------------|
| Order | Training Tasks | CILOs (symbols) | Number of weeks | Contact hours |
| 1 | General introduction to practical methods in biochemistry and identification of reagents and tools used | a1, a2 | 1 | 2 |
| 2 | Sugars: Detection of sugars and differentiating between single and two sugars and between five and six | a1, a2, b1, b2, c1, c2, d1 | 2,3 | 4 |
| 3 | Proteins: Detection of protein properties, protein structure breakdown, and the influence of heavy elements, solvents and heat on protein properties | a1, a2, b1, b2, c1, c2, d1 | 4,5 | 4 |

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| | | | | |
|--|---|----------------------------|-----------|-----------|
| | Blood Iron Detection (Hemoprotein) Detection of phosphate group in milk (phosphorous protein) Detection of saliva sugar group (glycoprotein) | | | |
| 4 | Practical training for the detection of biomass (various sugars and proteins) | a1, a2, b1, b2, c1, c2, d1 | 6 | 2 |
| 5 | amino acids: Study the properties and division of amino acids Knowledge of essential and non-essential amino acids Detecting and differentiating amino acids | a1, a2, b1, b2, c1, c2, d1 | 7,8 | 4 |
| 6 | urine: Know the basic constituents of urine Knowledge of pathological components and method for detection such as diabetes | a1, a2, b1, b2, c1, c2, d1 | 9,10 | 4 |
| 7 | Cholesterol: Differentiate between bad and beneficial cholesterol Detection of cholesterol in the brain of animal | a1, a2, b1, b2, c1, c2, d1 | 11 | 2 |
| 8 | Estimation of the activity of amylase from saliva ,extraction of enzyme | a1, a2, b1, b2, c1, c2, d1 | 12,13 | 4 |
| 9 | Practical training for the detection of biomass (various amino acids and cholesterol) | a1, a2, b1, b2, c1, c2, d1 | 14 | 2 |
| Number of Weeks /and Units Per Semester | | | 14 | 28 |

V. Teaching strategies of the course:

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Lectures, discussion, practical presentation and simulation method, self-learning, cooperatives learning, lab work

3-Assessment Methods:

Tasks and assignments Quiz 1 &2, Midterm exam, final exam

VI. Schedule of Assessment Tasks for Students During the Semester:

| No. | Assessment Method | Week Due | Mark | Proportion of Final Assessment | Aligned Course Learning Outcomes (CILOs symbols) |
|-------|---------------------------|----------|------|--------------------------------|--|
| 1 | Participation and quizzes | 1-12 | 10 | 10% | a1,a2,b1,b2,c1,c2,c3,d1,d2 |
| 2 | Assignments | 4-12 | 10 | 10% | a1,a2,b1,b2,c1,c2,c3,d1,d2 |
| 3 | Mid-semester exam | 8 | 20 | 20% | a1,a2,b1,b2,c1,c2,d1 |
| 4 | Final Exam | 16 | 60 | 60% | a1,a2,b1,b2,c1,c2,c3,d1,d2 |
| Total | | | 100 | 100% | |

VII. Students' Support:

| Office Hours/week | Other Procedures (if any) |
|-------------------|---------------------------|
| | |

VIII. Learning Resource (MLA style or APA style)S:

Required Textbook(s) (maximum two)

D. L. Nelson and M. M. Cox. Lehninger Principles of Biochemistry. W.H. Freeman. 7th edition, (2017)(

Zilva, M.; Charles, F. and Myne, N. (1993): Clinical Chemistry in Diagnosis and Treatment. 6th ed. Saunders, Philadelhis, U.S.A.

Recommended Readings and Reference Materials

1- Structure and Mechanism in Protein Science: A Guide to Enzyme Catalysis and Protein Folding, 2nd edition (1999)

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|--|--|
| Essential References | |
| | W. Rodwell, D. Bender and K. M. Botham. Harper's Illustrated Biochemistry. McGraw-Hill Education. 31st edition, (2018) |
| Electronic Materials and Web Sites etc. | |
| | https://pubs.acs.org/doi/abs/10.1021/ed084p1866 ▪ |
| Other Learning Material: | |
| | - |

| X. Course Policies: | |
|----------------------------|---|
| 1 | Class Attendance: MANDATORY TO ATTEND ALL COURSE LECTURES |
| 2 | Tardy: Not allowed at all. Students must be in class 10 minutes prior to the beginning of lectures. |
| 3 | Exam Attendance/Punctuality: Attendance is mandatory; absence is accepted with valid excuse. |
| 4 | Assignments & Projects: All assignments and projects are to be submitted on their due date. Any assignment turned in after the due date will not be accepted without valid and reasonable excuse. |
| 5 | Cheating: Not tolerated and may lead to EXPELLING the student from the program |
| 6 | Plagiarism: Not tolerated AT ALL and may lead to EXPELLING the student from the program |
| 7 | Other policies: <ol style="list-style-type: none">1. All devices must be on silent or at least on vibration during lectures/labs.2. Before any exam (written, practical, oral) student's identity will be checked (student's card, ID, passport). Without any of these documents, the student will not be allowed in the exam room.3. Any of type/ form of cheating is not allowed no matter what.4. Maintain silence during lectures and disturbance is not allowed. |

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Course Plan of Biochemistry

| X. - Information about Faculty Member Responsible for the Course: | | | | | | | |
|---|---|--------------|-----|-----|-----|-----|-----|
| Name of Faculty Member | Maher Ali Ahmed Al-Maqtari | Office Hours | | | | | |
| Location & Telephone No. | Sanaa University - College of Science Phone number 773262252 | SAT | SUN | MON | TUE | WED | THU |
| E-mail | al.maqtarimaher@yahoo.com | | | | | | |

| XI. Course Identification and General Information: | | |
|--|-----------------------|--------------|
| 1 | Course Title: | Biochemistry |
| 2 | Course Number & Code: | PH241 |
| 3 | Credit hours: | C.H |

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| | | Th. | Semin ar | Pr. | F. Tr. | Tota l |
|----|---|---|-------------|-----|-----------|-----------|
| | | 3 | - | 1 | | 4 |
| 4 | Study level/year at which this course is offered: | Second Year - First Semester | | | | |
| 5 | Pre –requisite (if any): | FR114 | | | | |
| 6 | Co –requisite (if any): | None | | | | |
| 6 | Program (s) in which the course is offered | The second level - the first semester | | | | |
| 7 | Language of teaching the course: | English – Arabic | | | | |
| 8 | System of Study: | Regular / Semesters | | | | |
| 9 | Mode of delivery: | Prof. Maher Ali Ahmed Al-Maqtari | | | | |
| 10 | Location of teaching the course: | Faculty of Veterinary Medicine Building | | | | |

II. Course Description:

The course explores the basic principles of biochemistry by providing a basic understanding of the scientific basis of life processes. It addresses the classification, molecules, and chemical properties of major biomolecules such as carbohydrates, fats, proteins, nucleic acids and the enzyme with an emphasis on their biological importance in animals. It also covers metabolic pathways and pH regulation of biological fluids by insulators. At the end of the course, students can demonstrate knowledge of the chemical processes that occur in living organisms.

II. Intended learning outcomes (ILOs) of the course:

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After completing this course, students will be able to:

- a1- Explains the principles and purposes of the different biochemical and biological processes of composition in humans and animals
- a2- Identifies the structure and functions of the biomolecular compounds present in living cells and their relationship to animal production.
- b1- Compares many concepts related to living and catalytic matter found in humans and animals
- b2- Explains the results of chemical analysis of biomolecules and enzymes quantitatively and descriptively to diagnose diseases prevalent in animals
- c1- Employs the physical and chemical properties of the biomolecules and enzymes to perform the necessary tests
- c2- Applies the basic principles of metabolism of biomolecules in identifying the different pathways in metabolism in humans and animals
- d1- Collaborates with other students to engage in teamwork, group discussion, and problem solving
- d2- Contributes actively using modern technology

V. Course Content:

A – Theoretical Aspect:

| Order | Topics List | Week Due | Contact Hours |
|-------|--|----------|---------------|
| 1 | Introduction to the principles of biochemistry | 1 | 3 |
| 2 | Carbohydrates | 2,3,4 | 9 |
| 3 | Amino acids (proteins) | 5 | 3 |
| 4 | Fats | 6,7 | 6 |
| 5 | Mid-Term Exam. | 8 | 3 |
| 6 | Nucleic acids | 9 | 3 |
| 7 | Introduction to enzymes | 10 | 3 |
| 8 | Properties, naming and classification of enzymes | 11,12,13 | 9 |

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|---|---|-------|----|
| 9 | kinetics of enzyme reactions and diagnostic enzymes | 14,15 | 6 |
| 10 | Final-Exam. | 16 | 3 |
| Number of Weeks /and Units Per Semester | | 16 | 48 |

| b- Training Aspect: | | | |
|---------------------|---|----------|---------------|
| Order | Training Tasks | Week Due | Contact hours |
| 1 | General introduction to practical methods in biochemistry and identification of reagents and tools used | 1 | 2 |
| 2 | Sugars: Detection of sugars and differentiating between single and two sugars and between five and six | 2,3 | 4 |
| 3 | Proteins: Detection of protein properties, protein structure breakdown, and the influence of heavy elements, solvents and heat on protein properties Blood Iron Detection (Hemoprotein) Detection of phosphate group in milk (phosphorous protein) Detection of saliva sugar group (glycoprotein) | 4,5 | 4 |
| 4 | Practical training for the detection of biomass (various sugars and proteins) | 6 | 2 |
| 5 | Med-Term Exam. | 7 | 2 |
| 6 | amino acids: Study the properties and division of amino acids Knowledge of essential and non-essential amino acids Detecting and differentiating amino acids | 8,9 | 4 |
| 7 | urine: Know the basic constituents of urine Knowledge of pathological components and method for detection such as diabetes | 10,11 | 4 |
| 8 | Cholesterol: Differentiate between bad and beneficial cholesterol Detection of cholesterol in the brain of animal | 12 | 2 |

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|---|--|-------|----|
| 9 | Estimation of the activity of amylase from saliva, extraction of enzyme | 13,14 | 4 |
| 10 | Practical training for the detection of biomass (various amino acids and cholesterol) | 15 | 2 |
| 11 | Final Exam | 16 | 2 |
| Number of Weeks /and Units Per Semester | | 16 | 32 |

V. Teaching strategies of the course:

- Lectures
 - discussion
 - Brainstorming
 - Problem solving
 - Simulation Method Practical presentations&
 - Practical in computer Lab) Lab works(
 - projects
 - Self-learning
 - Cooperative Learning
- Share experiences between colleague

VI. Assessment Methods:

| No. | Type of Assessment Tasks | Week Due | Mark | Proportion of Final Assessment |
|-----|---------------------------|----------|------|--------------------------------|
| 1 | Participation and quizzes | 1-12 | 10 | 10% |
| 2 | Assignments | 4-12 | 10 | 10% |
| 3 | Mid-semester exam | 8 | 20 | 20% |
| 4 | Final Exam | 16 | 60 | 60% |
| 5 | Total | | 100 | 100% |

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| II. Learning Resources: | |
|--|---|
| 1. | |
| 1- Required Textbook(s) (maximum two). | |
| | D. L. Nelson and M. M. Cox. Lehninger Principles of Biochemistry. W.H. Freeman. 7th edition, (2017)• Zilva, M.; Charles, F. and Myne, N. (1993): Clinical Chemistry: Diagnosis and Treatment. 6th ed. Saunders, Philadelphia, U.S.A. |
| 2- Essential References. | |
| | W. Rodwell, D. Bender and K. M. Botham. Harper's Illustrated Biochemistry. McGraw-Hill Education. 31st edition, (2018) |
| 3- Electronic Materials and Web Sites etc. | |
| | https://pubs.acs.org/doi/abs/10.1021/ed084p1866 ▪ |

| I. Course Policies: | |
|---------------------|---|
| 1 | Class Attendance: MANDATORY TO ATTEND ALL COURSE LECTURES |
| 2 | Tardy: Not allowed at all. Students must be in class 10 minutes prior to the beginning of lectures. |
| 3 | Exam Attendance/Punctuality: Attendance is mandatory; absence is accepted with valid excuse. |
| 4 | Assignments & Projects: All assignments and projects are to be submitted on their due date. Any assignment turned in after the due date will not be accepted without valid and reasonable excuse. |
| 5 | Cheating: Not tolerated and may lead to EXPELLING the student from the program |
| 6 | Plagiarism: Not tolerated AT ALL and may lead to EXPELLING the student from the program |

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|---|---|
| 7 | Other policies: <ol style="list-style-type: none">1. All devices must be on silent or at least on vibration during lectures/labs.2. Before any exam (written, practical, oral) student's identity will be checked (student's card, ID, passport). Without any of these documents, the student will not be allowed in the exam room.3. Any of type/ form of cheating is not allowed no matter what.4. Maintain silence during lectures and disturbance is not allowed. |
|---|---|

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