

Republic of Yemen
Ministry of Higher Education & Scientific Research
21 September University for Medicals and Applied Sciences



Faculty of Clinical Pharmacy

Bachelor of Clinical Pharmacy & Pharm. D.

Course Specification of

Immunology

Course Code. (03.02.211)

2022



T4: This Template is Developed and Approved by CAQA-Yemen, 2024

Prepared by:	Reviewed by:	Head of the Department:	Vice Dean for Quality affairs	Dean of College:
Dr. Ghamdan AL-Tahish	Dr. Ebtesam Al- Zabedi	Dr. -----	Dr. Abdulelah Thabet	Dr. Ali Alyahawi

I. General Information:

1.	Course Title:	Immunology			
2.	Course Code:	03.02.211			
3.	Credit Hours:	Credit Hours	Theory Contact Hours		Practical Contact Hours
			Lecture	Tutorial/Seminar	Lab
		2	2		--
4.	Level/ Semester at which this Course is offered:	3 rd Level - / 2 nd Semester ----			
5.	Pre –Requisite (if any):	Human Physiology1, Anatomy and Histology,			
6.	Co –Requisite (if any):	Basic Microbiology			
7.	Program (s) in which the Course is Offered:	Bachelor of Clinical Pharmacy & Pharm. D.			
8.	Language of Teaching the Course:	English			
9.	Location of Teaching the Course:	Faculty of Clinical Pharmacy			
10.	Prepared by:	Dr. Ghamdan AL-Tahish			
11.	Date and Number of Approval by Council:	2022			

II. Course Description:

The Immunity course provides students with a comprehensive understanding of the immune system, its functions, and its relevance to pharmacy practice. The course explores both innate and adaptive immunity, covering topics such as antigen recognition and presentation, immune cell activation and effector functions, immunopathology, and therapeutic interventions for immune-related diseases.

III. Course Intended Learning Outcomes (CILOs) : Upon successful completion of the course, students will be able to:		Referenced PILOs	
A. Knowledge and Understanding:		I, P or M/A	
a1	Describe the components and functions of the immune system, the mechanisms of innate and adaptive immunity, processes of antigen recognition and presentation		A1
a2	Demonstrate understanding of pathophysiology of immunological diseases and their strategies of treatment		A1
B. Intellectual Skills:			
b1	Evaluate the mechanisms of the immune responses and how relevant pharmaceutical agents targets the immune system, the principles of immunopathology and the pathogenesis of immune disorders.		B1
b2	Assess the therapeutic interventions used in the management of immune-related diseases including vaccines, antibodies, immunosuppressants, cytokines and related products		B1
C. Professional and Practical Skills:			
c1	Apply immunological knowledge to evaluate and optimize drug therapy		C1
c2	Select appropriate source of immunotherapeutic agent, plan and carry different evaluation experiments of efficacy		C1
D. Transferable Skills:			
d1	Communicate effectively about immunological concepts and their clinical implications.		D1
d2	Collaborate within interprofessional healthcare teams & Use educational technologies to address immunological challenges.		D1, D3
I= Introduced, P=Practiced or M/A= Mastered/Advanced			

(A) Alignment of Course Intended Learning Outcomes (Knowledge and Understanding) to Teaching Strategies and Assessment Methods:

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
a1 Describe the components and functions of the immune system, the mechanisms of innate and adaptive immunity , processes of antigen recognition and presentation	- Lecture - Instructor – student Interactive - Office hour	- Exam - Assignment - Quiz
a2 Demonstrate understanding of pathophysiology of immunological diseases and their strategies of treatment	- Lecture - Instructor – student Interactive - Office hour	- Exam - Assignment - Quiz

(B) Alignment of Course Intended Learning Outcomes (Intellectual Skills) to Teaching Strategies and Assessment Methods:

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
b1 Evaluate the mechanisms of the immune responses and how relevant pharmaceutical agents target the immune system, the principles of immunopathology and the pathogenesis of immune disorders.	- Lecture - Instructor – student Interactive - Exercises - Solving Problem Methods	- Problem-Solving Exercises. - Assignment - Quiz
b2 Assess the therapeutic interventions used in the management of immune-related diseases including vaccines, antibodies, immunosuppressants, cytokines and related products	- Lecture - Instructor – student Interactive - Exercises - Solving Problem Methods	- Problem-Solving Exercises. - Assignment - Quiz

(C) Alignment of Course Intended Learning Outcomes (Professional and Practical Skills) to Teaching Strategies and Assessment Methods:

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
c1 Apply immunological knowledge to evaluate and optimize drug therapy	- Lecture - Instructor – student Interactive - Self-Learning	- Exam - Assignment - Quiz
c2 Select appropriate source of immunotherapeutic agent, plan and carry different evaluation	- Lecture - Instructor – student Interactive - Self-Learning	- Exam - Assignment - Quiz

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	experiments of efficacy		
(D) Alignment of Course Intended Learning Outcomes (Transferable Skills) to Teaching Strategies and Assessment Methods:			
	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
d1	Communicate effectively about immunological concepts and their clinical implications.	- Self-Learning - Seminar - Exercises	- Presentation - Assignment - Quiz
d2	Collaborate within interprofessional healthcare teams & Use educational technologies to address immunological challenges.	- Seminar - Instructor–student Interactive - Exercises	Presentation

IV. Course Contents:

A. Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
1	Characteristics of the immune system	a1, a2, b1, b2, c1, d1-d2	General properties of the immune system -Innate &acquired immunity -Active & passive immunity - -Cells & tissues of the immune system	1	2
2	Innate or Natural immunity	a1,a2, b1, b2, d1, d2, c1,c2	□ Definition □ Mechanisms of innate immunity □ Anatomical Barrier and surface secretions □ Soluble molecules. □ Cellular components and functions □ Microbial flora	1	2
3	Innate or Natural immunity	a1,a2, b1, b2, d1-d2	Phagocytosis and inflammation	1	2
4	Adaptive Immunity:	a1,a2, b1,	- Introduction and Overview - Key Features of Adaptive	1	2

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		b2, d1-d2	Immunity - Cells and Organs of the Adaptive Immune System		
5	Antigens	a1,a2, b1,b2 , d1-d2	- □ Definitions of antigen and immunogen □ Hapten □ epitopes □ Factors affecting immunogenicity. □ Types of antigens of bacteria, viruses, environmental and human □ Types of T cell and B cell antigens. □ Super-antigens.	1	2
6	Antibodies	a1,a2, b1,b2 , d1-d2	□ Antibody structure and functions □ Isotypes structure, percentage, production and functions (IgG, IgM, IgA, IgD, IgE) □ Primary and secondary immune response □ Cross reaction □ Monoclonal and polyclonal antibodies	1	2
7	<u>Complement system</u>	a1,a2, b1,b2 , d1-d2	Definition Functions □ Activation Pathways and mechanisms. □ Biological Functions. □ Complements inhibitors	1	2
8	Med term	a1,a2,b1,b2,		1	2
9		a1,a2, b1,b2	- Major Histocompatibility Complex (MHC) and Antigen	1	2

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	Cell mediated immunity Antigen presentation	, d1-d2, c1,c2	Processing • ☐ Definition • ☐ MHC origin and Importance • ☐ Genes organization and inheritance • ☐ Types, structure and expression - T Cell Receptor (TCR) and B Cell Receptor (BCR) Signaling • ☐ Antigen presenting cells (APCs) • ☐ Endogenous pathway of antigen processing and presentation • ☐ Exogenous pathway of antigen processing and presentation		
10	Cells of adaptive immune response:	a1,a2, b1,b2 , d1-d2	T Cell-Mediated Immunity: • T cell surface molecules and markers T Cell Activation and Effector Functions - T Cell Activation and Differentiation - Cytotoxic T Lymphocytes (CTLs) and Helper T Cells. B Cell-Mediated Immunity: B Cell Activation and Antibody Production - B Cell Activation and Differentiation - Antibody Structure and Function	1	2
11	<u>Immunological response</u>	a1,a2, b1,b2 , d1-d2	- Helper T Cell Subsets and their Functions - Germinal Center Reactions and Antibody Affinity Maturation	1	2
12	vaccines and Immunization	a1,a2, b1,b2 , d1-d2,	• ☐ Active and passive immunization • ☐ Properties of ideal vaccine,	1	2



		c1,c2	□ types of vaccines; whole cell vaccines; (live attenuated and killed vaccines), subunit vaccines; synthetic peptides, recombinant, DNA vaccines, anti-ideotypes , and edible vaccines. □ Adjuvants □ Vaccines FDA regulations and testing		
13	Immune Disorders: Autoimmunity and Hypersensitivity Reactions	a1,a2, b1,b2 , d1-d2, c1,c2	- Mechanisms of Autoimmunity - Types and Mechanisms of Hypersensitivity Reactions	1	2
14	Immune Disorders: Immunodeficiency Diseases and Transplantation:	a1,a2, b1,b2 , d1-d2, c1,c2	- Primary and Secondary Immunodeficiencies - Organ Transplantation and Immune Rejection	1	2
15	Immunotherapeutics: Biologics and Immune Modulators	a1,a2, b1,b2 , d1-d2, c1,c2	- Monoclonal Antibodies and their Applications - Immune Modulating Drugs and Therapeutic Uses	1	2
16	Final exam	a1, a2, bl, b2, c1, c2		1	2
Number of Weeks /and Units Per Semester				16	32

B. Practical Aspect (Lab/Clinical) (if any):

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	- NA			
Number of Weeks /and Units Per Semester		16	32	

C. Tutorial Aspect (if any):



No.	Tutorial	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	NA			

VII. Assignments:

No.	Assignments	Week Due	Mark	Aligned CILOs (symbols)
1	Internet for some assignments and activities	4 th	5	a1, a2, bl, b2, c1, c2 d2, d2
2	Problem Solving in groups : Monoclonal Antibodies	12 th	5	a1, a2, bl, b2, c1, c2 d1, d2
Total			10	10

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Assignments	4 th , 12 th	10	10%	a1, a2, bl, b2, c1, c2 d2, d2
2	Quiz 1	6 th	5	5%	a1,a2,bl,b2,
3	Midterm Exam (Theory)	Week 7	10	10%	a1,a2,bl,b2,
4	Quiz 2	12 th	5	5%	a1,a2,bl,b2,
5	Final Exam (Theory)	Week 16	70	70%	a1, a2, bl, b2, c1, c2
Total			100	100%	

IX. Learning Resources:

1- Required Textbook(s):

- 1- . Shen W-C, Louie SG. Immunology for Pharmacy Students. 2005. Taylor & Francis e Library. Netherlands.
- 2- Owen J,A, Punt J, Stranford S,A, Jones P,P, 2019, Kuby immunology. 8th edition. W. H. Freeman and company. USA

2- Essential References.

- 1 -1- Flaherty DK. Immunology for Pharmacy. 2012. Mosby, inc. of Elsevier Inc. C
- 2- Chapel H, Haeney B, Misbah S, Snowden N, (2014) Essentials of Clinical Immunc

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6th ed. by John Wiley & Sons, Ltd, UK

3- Electronic Materials and Web Sites etc.

- 1 -Immunopaedia: educational website.
<https://www.immunopaedia.org.za/>
2. Immunology Videos
<https://www.immunology.utoronto.ca/immunology-videos>
3. The British Society for Allergy & Clinical Immunology (BSACI)
<https://www.bsaci.org/>
4. National institute of allergy and infectious diseases
<https://www.niaid.nih.gov/>
5. The American College of Allergy, Asthma and Immunology
<https://college.acaai.org/>

X. Course Policies: (Based on the Uniform Students' By law (2007))

1	Class Attendance: Class Attendance is mandatory. A student is considered absent and shall be banned from taking the final exam if his/her absence exceeds 25% of total classes.
2	Tardiness: A student will be considered late if he/she is not in class after 10 minutes of the start time of class.
3	Exam Attendance/Punctuality: No student shall be allowed to the exam hall after 30 minutes of the start time, and shall not leave the hall before half of the exam time has passed.
4	Assignments & Projects: Assignments and projects must be submitted on time. Students who delay their assignments or projects shall lose the mark allocated for the same.
5	Cheating: Cheating is an act of fraud that results in the cancelation of the student's exam or assignment. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
6	Forgery and Impersonation: Forgery/Impersonation is an act of fraud that results in the cancelation of the student's exam, assignment or project. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
7	Other policies: The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University



Administration.

Faculty of Clinical Pharmacy

Bachelor of Clinical Pharmacy & Pharm. D..

Course Plan (Syllabus) of **Immunology**

Course Code. 03.02.211

I. Information about Faculty Member Responsible for the Course:						
Name of Faculty Member:	Dr. Ghamdan AL-Tahish			Office Hours		
Location & Telephone No.:						
E-mail:				SAT	SUN	MON TUE WED THU

2022- 2023

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Republic of Yemen
Ministry of Higher Education & Scientific Research
21 SEPTEMBER UMAS
Faculty of Faculty of Clinical Pharmacy
Department of
Unit of Development & Quality assurance

الجمهورية اليمنية
وزارة التعليم العالي والبحث العلمي
جامعة 21 سبتمبر للعلوم الطبية والتطبيقية
كلية الصيدلة السريرية
قسم
وحدة التطوير وضمان الجودة

Prepared by:	Reviewed by:	Head of the Department:	Vice Dean for Quality affairs	Dean of College:
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I. General Information:

11.	Course Title:	Immunology			
12.	Course Code:	03.02.211			
13.	Credit Hours:	Credit Hours	Theory Contact Hours		Practical Contact Hours
			Lecture	Tutorial/Seminar	Lab Clinical
		2	2		-- --
14.	Level/ Semester at which this Course is offered:	3 rd Level - / 2 nd Semester ----			
15.	Pre –Requisite (if any):	Human Physiology, Anatomy and Histology,			
16.	Co –Requisite (if any):	Basic Microbiology			
17.	Program (s) in which the Course is Offered:	Bachelor of Clinical Pharmacy & Pharm. D.			
18.	Language of Teaching the Course:	English			
19.	Location of Teaching the Course:	Faculty of Clinical Pharmacy			
20.	Prepared by:	Dr. Ghamdan AL-Tahish			
11	Date and Number of Approval by Council:	2022			

II. Course Description:

The Immunity course provides students with a comprehensive understanding of the immune system, its functions, and its relevance to pharmacy practice. The course explores both innate and adaptive immunity, covering topics such as antigen recognition and presentation, immune cell activation and effector functions, immunopathology, and therapeutic interventions for immune-related diseases.



III. Course Intended Learning Outcomes (CILOs) :

Upon successful completion of the course, students will be able to:

A. Knowledge and Understanding:

a1	Describe the components and functions of the immune system, the mechanisms of innate and adaptive immunity, processes of antigen recognition and presentation
a2	Demonstrate understanding of pathophysiology of immunological diseases and their strategies of treatment

B. Intellectual Skills:

b1	Evaluate the mechanisms of the immune responses and how relevant pharmaceutical agents targets the immune system, the principles of immunopathology and the pathogenesis of immune disorders.
b2	Assess the therapeutic interventions used in the management of immune-related diseases including vaccines, antibodies, immunosuppressants, cytokines and related products

C. Professional and Practical Skills:

c1	Apply immunological knowledge to evaluate and optimize drug therapy
c2	Select appropriate source of immunotherapeutic agent, plan and carry different evaluation experiments of efficacy

D. Transferable Skills:

d1	Communicate effectively about immunological concepts and their clinical implications.
d2	Collaborate within interprofessional healthcare teams & Use educational technologies to address immunological challenges..

I= Introduced, P=Practiced or M/A= Mastered/Advanced

IV. Course Contents:

A. Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
1	Characteristics of the immune system	a1, a2, b1,b2, c1, d1-d2	General properties of the immune system -Innate &acquired immunity -Active & passive immunity - Cells & tissues of the immune system	1	2



2	Innate or Natural immunity	a1,a2, b1,b2 , d1, d2, c1,c2	□ Definition □ Mechanisms of innate immunity □ Anatomical Barrier and surface secretions □ Soluble molecules. □ Cellular components and functions □ Microbial flora	1	2
3	Innate or Natural immunity	a1,a2, b1,b2 , d1-d2	Phagocytosis and inflammation	1	2
4	Adaptive Immunity:	a1,a2, b1,b2 , d1-d2	- Introduction and Overview - Key Features of Adaptive Immunity - Cells and Organs of the Adaptive Immune System	1	2
5	Antigens	a1,a2, b1,b2 , d1-d2	□ Definitions of antigen and immunogen □ Hapten □ epitopes □ Factors affecting immunogenicity. □ Types of antigens of bacteria, viruses, environmental and human □ Types of T cell and B cell antigens. □ Super-antigens.	1	2
6	Antibodies	a1,a2, b1,b2 , d1-d2	□ Antibody structure and functions □ Isotypes structure, percentage, production and functions (IgG, IgM, IgA, IgD, IgE) □ Primary and secondary immune response □ Cross reaction □ Monoclonal and polyclonal antibodies	1	2



7	<u>Complement system</u>	a1,a2, b1,b2 , d1-d2	Definition Functions • ☐ Activation Pathways and mechanisms. • ☐ Biological Functions. • ☐ Complements inhibitors	1	2
8	Med term	a1,a2,bl,b 2,		1	2
9	Cell mediated immunity Antigen presentation	a1,a2, b1,b2 , d1-d2, c1,c2	- Major Histocompatibility Complex (MHC) and Antigen Processing • ☐ Definition • ☐ MHC origin and Importance • ☐ Genes organization and inheritance • ☐ Types, structure and expression - T Cell Receptor (TCR) and B Cell Receptor (BCR) Signaling • ☐ Antigen presenting cells (APCs) • ☐ Endogenous pathway of antigen processing and presentation • ☐ Exogenous pathway of antigen processing and presentation	1	2
10	Cells of adaptive immune response:	a1,a2, b1,b2 , d1-d2	T Cell-Mediated Immunity: • T cell surface molecules and markers T Cell Activation and Effector Functions - T Cell Activation and Differentiation - Cytotoxic T Lymphocytes (CTLs) and Helper T Cells. B Cell-Mediated Immunity: B Cell Activation and Antibody Production - B Cell Activation and Differentiation - Antibody Structure and Function	1	2
11	<u>Immunological</u>	a1,a2,	- Helper T Cell Subsets and their	1	2



	<u>response</u>	b1,b2 , d1-d2	Functions - Germinal Center Reactions and Antibody Affinity Maturation		
12	vaccines and Immunization	a1,a2, b1,b2 , d1-d2, c1,c2	• ☐ Active and passive immunization • ☐ Properties of ideal vaccine, • ☐ types of vaccines; whole cell vaccines; (live attenuated and killed vaccines), subunit vaccines; synthetic peptides, recombinant, DNA vaccines, anti-ideotypes , and edible vaccines. • ☐ Adjuvants • ☐ Vaccines FDA regulations and testing	1	2
13	Immune Disorders: Autoimmunity and Hypersensitivity Reactions	a1,a2, b1,b2 , d1-d2, c1,c2	- Mechanisms of Autoimmunity - Types and Mechanisms of Hypersensitivity Reactions	1	2
14	Immune Disorders: Immunodeficiency Diseases and Transplantation:	a1,a2, b1,b2 , d1-d2, c1,c2	- Primary and Secondary Immunodeficiencies - Organ Transplantation and Immune Rejection	1	2
15	Immunotherapeutics: Biologics and Immune Modulators	a1,a2, b1,b2 , d1-d2, c1,c2	- Monoclonal Antibodies and their Applications - Immune Modulating Drugs and Therapeutic Uses	1	2
16	Final exam	a1, a2, bl, b2, c1, c2		1	2
Number of Weeks /and Units Per Semester				16	32

B. Practical Aspect (Lab/Clinical) (if any):

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	- NA			
Number of Weeks /and Units Per Semester		16	32	



C. Tutorial Aspect (if any):

No.	Tutorial	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	NA			

- VI. Teaching Strategies of the Course:

- Lecture
- Instructor – student Interactive
- Exercises
- Presentation
- Office hours
- Seminar
- Assignment
- Self-Learning

VII. Assessment Methods of the Course:

- Assignments
- Quiz
- Exam
- Oral Presentation

VII. Assignments:

No.	Assignments	Week Due	Mark	Aligned CILOs (symbols)
1	Internet for some assignments and activities	4 th	5	a1, a2, bl, b2, c1, c2 d2, d2
2	Problem Solving in groups : Monoclonal Antibodies	12 th	5	a1, a2, bl, b2, c1, c2 d1, d2
Total			10	10

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Assignments	4th, 12 th	10	10%	a1, a2, bl, b2, c1, c2 d2, d2



2	Quiz 1	6 th	5	5%	a1,a2,bl,b2,
3	Midterm Exam (Theory)	Week 7	10	10%	a1,a2,bl,b2,
4	Quiz 2	12 th	5	5%	a1,a2,bl,b2,
5	Final Exam (Theory)	Week 16	70	70%	a1, a2, bl, b2, c1, c2
Total			100	100%	

IX. Learning Resources:

1- Required Textbook(s):

- 3- . Shen W-C, Louie SG. Immunology for Pharmacy Students. 2005. Taylor & Francis e Library. Netherlands.
- 4- Owen J,A, Punt J, Stranford S,A, Jones P,P, 2019, Kuby immunology. 8th edition. W. H. Freeman and company. USA

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- 1 -1- Flaherty DK. Immunology for Pharmacy. 2012. Mosby, inc. of Elsevier Inc. C
- 2- Chapel H, Haeney B, Misbah S, Snowden N, (2014) Essentials of Clinical Immunc 6th ed. by John Wiley & Sons, Ltd, UK

3- Electronic Materials and Web Sites etc.

- 1 -Immunopaedia: educational website.
<https://www.immunopaedia.org.za/>
2. Immunology Videos
<https://www.immunology.utoronto.ca/immunology-videos>
3. The British Society for Allergy & Clinical Immunology (BSACI)
<https://www.bsaci.org/>
4. National institute of allergy and infectious diseases
<https://www.niaid.nih.gov/>
5. The American College of Allergy, Asthma and Immunology
<https://college.acaii.org/>

X. Course Policies: (Based on the Uniform Students' By law (2007)

Class Attendance:

- 1 Class Attendance is mandatory. A student is considered absent and shall be banned from taking the final exam if his/her absence exceeds 25% of total classes.

Tardiness:

- 2 A student will be considered late if he/she is not in class after 10 minutes of the start time of class.

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Reviewed by:

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Dean of College:

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3	Exam Attendance/Punctuality: No student shall be allowed to the exam hall after 30 minutes of the start time, and shall not leave the hall before half of the exam time has passed.
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6	Forgery and Impersonation: Forgery/Impersonation is an act of fraud that results in the cancelation of the student's exam, assignment or project. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
7	Other policies: The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University Administration.