

Republic of Yemen
Minster of Higher
Education and
Scientific Research
Sana'a University
Faculty of Computer &
IT
Quality Assurance Unit



الجمهورية اليمنية
وزارة التعليم العالي والبحث
العلمي
جامعة - صنعاء
كلية الحاسوب وتكنولوجيا
المعلومات
وحدة ضمان الجودة



Faculty of Computer & Information Technology

Department of Information Technology

Program of Information Technology

Course Specification of System Administration & Maintenance

Course No (.....)

Head of Department	Vise Dean for Quality Assurance	Dean of the Faculty	Dean of Academic Development center and Quality
Ibrahim A. Al-Balatah	Dr. Anwar Al-Shamiri	Dr. Nagi Al-Shibani	Assoc. Prof. Dr.Huda Al.Emad

Rector of Sana'a University

Prof. Dr. Qassim Mohammed Abbas

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2020/2021

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I. Course Identification and General Information:						
1	Course Title:	System Administration & Maintenance				
2	Course Code & Number:					
3	Credit hours:	C.H				TOTAL
		Th.	Seminar	Pr	Tr.	
		2	-	2	-	3
4	Study level/ semester at which this course is offered:	3 rd Year/2 nd Semester				
5	Pre –requisite (if any):	Computer Networks/Operating System Concepts/Information Security				
6	Co –requisite (if any):	None				
7	Program (s) in which the course is offered:	Information Technology				
8	Language of teaching the course:	Arabic/English				
9	Study System	Term based system				
10	Mode of delivery:	Full Tome				
11	Location of teaching the course:	Faculty of Computer and Information Technology				

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12	Prepared By:	Dr. Adnan Al-mutawkkil
13	Date of Approval	

II. Course Description:
<p>This course is a one-semester course in which students will learn about the principles of system administration and reveals why IT departments do the things they do, such as imposing limitations on users. With a focus on managing unix-like operating systems. This course enables student to combine the theory of debugging, troubleshooting, management and configuration with the reality of systems administration. To demonstrate administration and maintenance principles that apply to all platforms, the course utilize the major operating system families: Linux (through Ubuntu), and Windows (7, 10, and Server). The course starts with a review of general computer administration basics before addressing such issues as user account management, interoperability, data warehousing, capacity planning, load balancing, security, and disaster preparedness.</p>

III. Course Intended learning outcomes (CILOs) of the course (maximum 8CILOs)		Referenced PILOs (Only write code number of referenced Program Intended learning outcomes)
a.1	Show understanding of the role & responsibilities of a system administrator and discuss the importance of system configuration for an organization.	A1, A3

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a.2	Describe the system boot process.	A3
b.1	Distinguish between server and client services.	B4
b.2	Evaluate various operating systems and recommend a particular operating system to satisfy given needs.	B1, B3
c.1	Install at least one server operating system including setup and manage user accounts and groups.	C4
c.2	Configure various server and client services including configure and manage simple network and security services on a Linux system.	C4
d.1	Evaluate when service packs and operating system updates should be installed.	D6

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

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
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a1- Show understanding of the role & responsibilities of a system administrator and discuss the importance of system configuration for an organization.	Lecture, Individual and Group Discussion	Assignments/quizzes, MidTerm Exam, Final Exam
a2- Describe the system boot process.	Lecture, Individual and Group Discussion	Assignments/quizzes, MidTerm Exam

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

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Distinguish between server and client services.	Lecture, Demonstration Method (Labs)	Assignments/quizzes, MidTerm Exam, MidTerm Exam (practice)
b2- Evaluate various operating systems and recommend a particular operating system to satisfy given needs.	Lecture, Demonstration Method (Labs)	Group Project, Assignments/quizzes

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

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Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1- Install at least one server operating system including setup and manage user accounts and groups.	Lecture, Demonstration Method (Labs), Individual and Group Discussion	Group Project, Labs assignments, Assignments/quizzes, MidTerm Exam (practical), Final Exam (practical)
c2- Configure various server and client services including configure and manage simple network and security services on a Linux system.	Lecture, Demonstration Method (Labs), Individual and Group Discussion	Group Project, Labs assignments, Assignments/quizzes, MidTerm Exam (practical), Final Exam (practical)

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Evaluate when service packs and operating system updates should be installed.	Lecture, Individual and Group Discussion	Assignments/quizzes, Exam

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IV. Course Content:					
A – Theoretical Aspect:					
Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	Introduction	a1	<ul style="list-style-type: none"> - What is System Administration? - History of System Administration. - User Account Management - Hardware Management - Data Backups - Software Installation/Maintenance - System Monitoring 	1	2
2	Desktop, servers and services	d1	<ul style="list-style-type: none"> - Managing Desktops - Updating system and apps - Network Configuration - Managing Servers - Data Backups - Remote Administration - 	2	4
3	System startup and shutdown	a2, c1	<ul style="list-style-type: none"> - Bootstrapping - Booting PCs - Boot loaders - Booting into single user mode - Startup scripts 	1	2

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			<ul style="list-style-type: none"> - Rebooting and shutting down - Process 		
4	Disks, partitions, and filesystems	c1, c2	<ul style="list-style-type: none"> - Disks - Partitions - Volumes - Filesystems - Files - Mirrored Root Disks 	1	2
5	Printing	b1	<ul style="list-style-type: none"> - Print architecture - Printing terms - Types of printers - LPD, LPRng, CUPS - Print Server Packages - client utility 	1	2
6	User accounts	a1	<ul style="list-style-type: none"> - The /etc/passwd file - The /etc/shadow file - The /etc/group file - Adding users - Removing users - Disabling logins - Account management utilities - Root powers 	1	2
7	Monitoring	b1, b2	<ul style="list-style-type: none"> - Historical data - Real-time monitoring - End-to-end tests - Application response time monitoring - Syslog and Log files 	1	2
8	Namespaces and DNS	b1, b2	<ul style="list-style-type: none"> - What is the meaning of Namespace? - What does DNS do? 	1	3

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			<ul style="list-style-type: none"> - The DNS namespace - BIND software - How DNS works - DNS database - Testing and debugging (tools) 		
9	The Network File System	b1, b2, c2	<ul style="list-style-type: none"> - NFS Introduction - Server-side NFS - Client-side NFS - NFS Statistics with nfsstat - Dedicated NFS File Servers - Automatic Mounting 	1	2
10	Installation and debugging	c1, c2	<ul style="list-style-type: none"> - Software Installation, Localization, and Maintenance - Change Management - Debugging 	1	2
11	NIS: Network Information Service	c1, c2	<ul style="list-style-type: none"> - Sharing system files - Pulling files - NIS: Network Information Service - NIS organization - Setting up NIS domain 	2	4
12	Disaster Recovery, Data Integrity and Backup	d1	<ul style="list-style-type: none"> - Why disaster recovery? - Risk analysis? - Legal obligations - Damage limitation - Preparation - Backup and Restore 	1	2
Number of Weeks /and Units Per Semester				14	28

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B - Practical Aspect:				
Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	<ul style="list-style-type: none"> OS Installation and Printing 	1	2	c1, c2
2	<ul style="list-style-type: none"> Using Linux and the shell 	2	4	a1, b1, b2
3	<ul style="list-style-type: none"> RPMs, updates, and installing packages Schedule a periodic job with cron Startup scripts 	1	2	d1
4	<ul style="list-style-type: none"> disk, volume, and partition management home file system Software RAID swap Resizing a volume 	2	4	c1, c2

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5	<ul style="list-style-type: none"> Managing accounts Network monitoring Local network connections 	2	4	a1, c2
6	<ul style="list-style-type: none"> DNS, Networking, Apache, CGI scripting 	2	4	c2
7	<ul style="list-style-type: none"> networking services 	2	4	c2
Number of Weeks /and Units Per Semester		12	24	

V. Teaching strategies of the course:

Lecture

Individual and Group Discussion

Demonstration Method (Labs)

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VI. Assignments:				
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Assignments/quizzes	a1, a2	2 nd , 4 th , 6 th , 10 th , 12 th	5
2	Labs assignments	c1,c2	2 nd , 4 th , 6 th , 10 th , 12 th	5
3	Group Project	a1, a2, b1, b2, d1	14 th	5
Total				15

VII. 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	2 nd , 4 th , 6 th , 10 th , 12 th , 14 th	15	15	a1, a2, b1, b2, c1,c2, d1
2	MidTerm Exam (practical)	9 th	5	5	c1, c2, d1

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3	MidTerm Exam	8 th	10	10	a1, a2, b1, b2, d1
4	Final Exam (practical)	14 th	10	10	b1, b2c1, c2, d1
5	Final Exam	16 th	60	60	a1, a2, b1, b2, d1

VIII. Learning Resources:

- Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).

1- Required Textbook(s) (maximum two).

1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin, 2017, "UNIX and Linux System Administration Handbook", Addison-Wesley, 5th edition,
2. Thomas A. Limoncelli; Christina J. Hogan; Strata R. Chalup, 2016, " The Practice of System and Network Administration", Volume 1: Devops and Other Best Practices for Enterprise It.

2- Essential References.

1. Thomas A. Limoncelli , Strata R. Chalup , Christina J. Hogan, 2014, " The Practice of Cloud System Administration ", Addison Wesley.
2. Aleen Frisch , 2009, "Essential System Administration", O'Reilly, 3rd Edition

3- Electronic Materials and Web Sites etc.

- 1-ocw.mit.edu/courses/#electrical-engineering-and-computer-science
- 2-https://see.stanford.edu/

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3-<https://www.codecademy.com/catalog/subject/all>

IX. Course Policies:

Unless otherwise stated, the normal course administration policies and rules of the Faculty of Computer and Information Technology apply. For the policy, see: -----

The University Regulations on academic misconduct will be strictly enforced. Please refer to -----

1	<p>Class Attendance: A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic</p>
2	<p>Tardy: For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he will be considered as absent.</p>
3	<p>Exam Attendance/Punctuality: A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.</p>
4	<p>Assignments & Project The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.</p>
5	<p>Cheating: For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.</p>

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6	Plagiarism: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7	Other policies: <ul style="list-style-type: none">- Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room- Mobile phones are not allowed in class during the examination.- Lecture notes and assignments my given directly to students using soft or hard copy

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Course syllabus of System Administration & Maintenance

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Course No (.....)

2020/2021

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

II. Course Identification and General Information:	
1- Course Title:	System Administration & Maintenance

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2-	Course Number & Code:					
3-	Credit hours:	C.H				Total
		Th.	Seminar	Pr.	F. Tr.	
		2	-	2	-	3
4-	Study level/year at which this course is offered:	3 rd Year/2 nd Semester				
5-	Pre –requisite (if any):	Computer Networks/Operating System Concepts/Information Security				
6-	Co –requisite (if any):	None				
7-	Program (s) in which the course is offered	Information Technology				
8-	Language of teaching the course:	Arabic/English				
9-	System of Study:	Term based system				
10-	Mode of delivery:	Full Time				
11-	Location of teaching the course:	Faculty of Computer and Information Technology				

III. Course Description:

This course is a one-semester course in which students will learn about the principle system administration and reveals why IT departments do the things they do, such as imposing limitations on users. With a focus on managing unix-like operating systems

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This course enables student to combine the theory of debugging, troubleshooting, management and configuration with the reality of systems administration. To demonstrate administration and maintenance principles that apply to all platforms, the course utilize the major operating system families: Linux (through Ubuntu), and Windows (7, 10, and Server). The course starts with a review of general computer administration basics before addressing such issues as user account management, interoperability, data warehousing, capacity planning, load balancing, security, and disaster preparedness.

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

- Brief summary of the knowledge or skill the course is intended to develop:
 1. Show understanding of the role & responsibilities of a system administrator and discuss the importance of system configuration for an organization.
 2. Describe the system boot process.
 3. Distinguish and evaluate between server and client services.
 4. Evaluate various operating systems and recommend a particular operating system to satisfy given needs.
 5. Install at least one server operating system including setup and manage user accounts and groups.
 6. Configure various server and client services including configure and manage a simple network and security services on a Linux system.
 7. Evaluate when service packs and operating system updates should be installed.

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V. Course Content:			
<ul style="list-style-type: none"> Distribution of Semester Weekly Plan of Course Topics/Items and Activities. 			
A – Theoretical Aspect:			
Order	Topics List	Week Due	Contact Hours
1	Introduction <ul style="list-style-type: none"> What is System Administration ? History of System Administration. User Account Management Hardware Management Data Backups Software Installation/Maintenance System Monitoring 	1 st	2
2	Desktop, servers and services <ul style="list-style-type: none"> Managing Desktops Updating system and apps Network Configuration Managing Servers Data Backups Remote Administration 	2 nd 3 rd	4
3	System startup and shutdown <ul style="list-style-type: none"> Bootstrapping Booting PCs Boot loaders Booting into single user mode Startup scripts Rebooting and shutting down 	4 th 5 th	4

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	- Process		
4	Disks, partitions, and filesystems - Disks - Partitions - Volumes - Filesystems - Files - Mirrored Root Disks	5 th	2
5	Printing - Print architecture - Printing terms - Types of printers - LPD, LPRng, CUPS - Print Server Packages - client utility	6 th	2
6	User accounts - The /etc/passwd file - The /etc/shadow file - The /etc/group file - Adding users - Removing users - Disabling logins - Account - management utilities - Root powers	7 th	2
7	MidTerm Exam	8 th	2
8	Monitoring - Historical data - Real-time monitoring	9 th	

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	<ul style="list-style-type: none"> - End-to-end tests - Application response time monitoring - Syslog and Log files 		2
9	<p>Namespaces and DNS</p> <ul style="list-style-type: none"> - What is the meaning of Namespace? - What does DNS do? - The DNS namespace - BIND software - How DNS works - DNS database - Testing and debugging (tools) 	10 th	2
10	<p>The Network File System</p> <ul style="list-style-type: none"> - NFS Introduction - Server-side NFS - Client-side NFS - NFS Statistics with nfsstat - Dedicated NFS File Servers - Automatic Mounting 	11 th	2
11	<p>Installation and debugging</p> <ul style="list-style-type: none"> - Software Installation, Localization, and Maintenance - Change Management - Debugging 	12 th	2
12	<p>NIS: Network Information Service</p> <ul style="list-style-type: none"> - Sharing system files - Pulling files - NIS: Network Information Service - NIS organization - Setting up NIS domain 	13 th ,14 th	4

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13	Disaster Recovery, Data Integrity and Backup - Why disaster recovery? - Risk analysis? - Legal obligations - Damage limitation - Preparation - Backup and Restore	15 th	2
14	Final Exam	16 th	2
Number of Weeks /and Units Per Semester		16	32

B – Practical Aspect:			
Order	Topics List	Week Due	Contact Hours
1	- OS Installation and Printing	1 st	2
2	- Using Linux and the shell	2 nd , 3 rd	4
3	- RPMs, updates, and installing packages - Schedule a periodic job with cron - Startup scripts	4 th	2
4	- disk, volume, and partition management - home file system	5 th , 6 th	4

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	- Software RAID - swap - Resizing a volume		
5	- Managing accounts - Network monitoring - Local network connections	7 th , 8 th	4
6	- MidTerm Exam	9 th	2
7	- DNS, Networking, Apache, CGI scripting	10 th , 11 th	4
8	- networking services	12 th , 13 th	4
9	- Final Exam	14 th	2
Number of Weeks /and Units Per Semester		14	28

VI. Teaching strategies of the course:

Lecture

Individual and Group Discussion

Demonstration Method (Labs)

Head of Department

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VII. Assignments:				
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Assignments/quizzes	a1, a2, c1	2 nd , 4 th , 6 th , 10 th , 12 th	5
2	Labs assignments	c1,c2	2 nd , 4 th , 6 th , 10 th , 12 th	5
3	Group Project	a1, a2, b1, b2, d1	14 th	5
	Total			15

VIII. Schedule of Assessment Tasks for Students During the Semester:				
Assessment	Type of Assessment Tasks	Week Due	Mark	Proportion of Final Assessment
1	Assignments	2 nd , 4 th , 6 th , 10 th , 12 th , 14 th	15	15
2	MidTerm Exam (practical)	9 th	5	5
3	MidTerm Exam	8 th	10	10
4	Final Exam (practical)	14 th	10	10
5	Final Exam	16 th	60	60

Head of Department

Ibrahim A. Al-Balatah

Vise Dean for Quality Assurance

Dr. Anwar Al-Shamiri

Dean of the Faculty

Dr. Nagi Al-Shibani

Dean of Academic Development center and Quality

Assoc. Prof. Dr.Huda Al.Emad

Rector of Sana'a University

Prof. Dr. Qassim Mohammed Abbas



IX. Learning Resources:

- Written in the following order: (Author – Year of publication – Title – Edition – Place of publication – Publisher).

1- Required Textbook(s) (maximum two).

1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin, 2017, " UNIX a Linux System Administration Handbook", Addison-Wesley, 5th edition.
2. Thomas A. Limoncelli; Christina J. Hogan; Strata R. Chalup, 2016, " The Practice of System and Network Administration", Volume 1: Devops and Other Best Practices for Enterprise It,

2- Essential References.

1. Thomas A. Limoncelli , Strata R. Chalup , Christina J. Hogan, 2014," The Practice of Cloud System Administration ", Addison Wesley.
2. Aleen Frisch , "Essential System Administration", 2009,O'Reilly, 3rd Edition,

3- Electronic Materials and Web Sites etc.

- 1-ocw.mit.edu/courses/#electrical-engineering-and-computer-science
- 2-https://see.stanford.edu/
- 3-https://www.codecademy.com/catalog/subject/all

X. Course Policies:

Unless otherwise stated, the normal course administration policies and rules of the Faculty of Computer and Information Technology apply. For the policy, see: -----

The University Regulations on academic misconduct will be strictly enforced. Please refer to -----

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1	<p>Class Attendance: A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic</p>
2	<p>Tardy: For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he will be considered as absent.</p>
3	<p>Exam Attendance/Punctuality: A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.</p>
4	<p>Assignments & Project The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.</p>
5	<p>Cheating: For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.</p>
6	<p>Plagiarism: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.</p>
7	<p>Other policies:</p> <ul style="list-style-type: none"> - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination.

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| | - Lecture notes and assignments my given directly to students using soft or hard copy |
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اللجنة الإشرافية

م.	الاسم	الصفة	التوقيع
١	أ.م.د. عبد الماجد الخليدي	نائب عميد الكلية للشؤون الأكاديمية	
٢	أ.م.د. احمد مجاهد	نائب عميد مركز التطوير الأكاديمي وضمان الجودة	
٣	د. حسين الأشول	ممثل المركز في الكلية	
٤	أ.د. إبراهيم المطاع	نائب رئيس الجامعة للشؤون الأكاديمية	

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