



54. Course Specification of Industrial Safety

I. Course Identification and General Information:						
.1	Course Title:	Industrial Safety.				
.2	Course Code & Number:	MT406.				
.3	Credit Hours:	C.H.				TOTAL CR. HRS.
		Th.	Seminar	Pr.	Tu.	
		2	-	-	2	3
.4	Study Level/ Semester at which this Course is offered:	Fifth Year- First Semester.				
.5	Pre –Requisite (if any):	None.				
.6	Co –Requisite (if any):	None.				
7.	Program (s) in which the Course is offered:	Mechatronics Engineering Program.				
.8	Language of Teaching the Course:	English Language.				
.9	Location of Teaching the Course:	Mechatronics Engineering Department.				
.10	Prepared by:	Prof. Dr. Omar H.Al-Sakaf.				
11.	Date of Approval:					

II. Course Description:
This course enhances safety awareness of students towards potential hazards in the workplace and provides them with useful practical knowledge for workplace safety which is mandated by national and international standards. Students will identify, evaluate and control potential hazards to prevent or mitigate harm or damage to people, property, or the environment. Emphasis is placed on main causes of industrial accidents and protection, risk management and accident prevention, automated systems and robot safety as well as safety management systems.

III. Course Intended learning outcomes (CILOs) of the course	Referenced PILOs
a1. Identify the workplace safety and health hazards and the ways to prevent accidents or injury by controlling these hazards.	A3
a2. Explain accident and injury information with respect to valid safety standards, state laws and regulations and recognize where and how to get additional safety information.	A7
b1. Analyze the causes and consequences of industrial safety accidents.	B1

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b2.	Classify the national and international applicable safety standards.	B5
c1.	Conduct a job safety analysis and accident investigation.	C1
c2.	Employ a safety and health program.	C5
d1.	Review soft skills, including teamwork, presentation and communication skills.	D1
d2.	Assess problem solving skills and use computer applications and Internet to extract information related to field of study and to prepare and present reports.	D7

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

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
Identify the workplace and health hazards safety to prevent and the ways accidents or injury by controlling these hazards. a1.	<ul style="list-style-type: none"> Active Lectures (supported with discussions). Tutorials. Case Studies. 	<ul style="list-style-type: none"> Written Assessments. Assignments. Presentations.
Explain accident and injury information with respect to valid safety standards, state laws and regulations and recognize where and how to get additional safety information. a2.	<ul style="list-style-type: none"> Active Lectures (supported with discussions). Tutorials. Case Studies. 	<ul style="list-style-type: none"> Written Assessments. Assignments. Presentations.

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

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
Analyze the causes and consequences of industrial safety accidents. b1.	<ul style="list-style-type: none"> Active Lectures (supported with discussions). Independent Applications of Engineering Analysis. Field Visits. 	<ul style="list-style-type: none"> Written Assessments. Assignments. Presentations.

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Classify the national and international applicable safety standards.	b2.	<ul style="list-style-type: none"> Active Lectures (supported with discussions). Independent Applications of Engineering Analysis. 	<ul style="list-style-type: none"> Written Assessments. Assignments. Presentations.
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(C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
Conduct a job safety analysis and accident investigation.	c1. <ul style="list-style-type: none"> Independent Learning and Work. Case Studies. Field Visits. 	<ul style="list-style-type: none"> Written Assessments. Assignments. Case Studies. Presentations.
Employ a safety and health program.	c2. <ul style="list-style-type: none"> Independent Learning and Work. Case Studies. 	<ul style="list-style-type: none"> Written Assessments. Assignments. Case Studies. Presentations.

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

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
Review soft skills, including teamwork, presentation and communication skills.	d1. <ul style="list-style-type: none"> Group Learning and Problem-Based Learning. Computer and Web-Based Learning. 	<ul style="list-style-type: none"> Assignments. Presentations.
Assess problem solving skills and use computer applications and Internet related to extract information to field of study and to prepare and present reports.	d2. <ul style="list-style-type: none"> Group Learning and Problem-Based Learning. Computer and Web-Based Learning. 	<ul style="list-style-type: none"> Assignments. Presentations.

IV. Course Content:

A – Theoretical Aspects:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
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1.	The Work Environment and Its Relation to the Safety and Occupational Health Requirements.	a1, b1	<ul style="list-style-type: none"> Facilities and Workstations. Maintenance of Plant Facilities. Industrial Sanitation and Personnel Facilities. Occupational Health Services. National and International Safety Codes and Standards. 	1	2
2.	Workplace Exposures and Personal Protective Equipment.	a1, a2, b1, c1	<ul style="list-style-type: none"> Main Causes of Industrial Accidents and Protection. Personal Protective Equipment: Function, Types, Selection. 	1	2
3.	Material Handling Safety.	a2, b1, c2	<ul style="list-style-type: none"> Types of Material Handling (Manual, Mechanized, Automated). Accidents and Injuries. Preventive Measures to Reduce Accidents. 	1	2
4.	Electrical Safety.	a1, a2, b1, c1, c2	<ul style="list-style-type: none"> Potential Hazards of Electricity. Forms of Electrical Hazards. Forms of Electric Shock and Protection. Protective Strategies Against Electrical Hazards. 	2	4
5.	Chemical Safety.	a1, a2, b1, c1, c2	<ul style="list-style-type: none"> Classification of Chemicals and Labeling. Chemical Accidents. Preventive Measures. The International Program on Chemical Safety. 	1	2

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6.	Machine Safety.	a1, a2, b1, c1, c2	<ul style="list-style-type: none"> • Potential Hazards of Machines. • Methods of Safeguarding. • Lockout and Tagout. 	1	2
7.	Mid-Term Exam.	a1, a2, b1, c1, c2	<ul style="list-style-type: none"> • The First 6 Chapters. 	1	2
8.	Fire Safety.	a1, a2, b1, c1, c2	<ul style="list-style-type: none"> • Fire Triangle. • Common Fire Hazards. • Fire Protection. • Fire Prevention. • Evacuation. • Fire Fighting. 	2	4
9.	Industrial Automation and Robots Safety.	a1, a2, b1, c1, c2	<ul style="list-style-type: none"> • Elements of Automation Safety Systems. • Programmable Automation Controllers. • Safety Communication Networks. • Hazards Associated with Robots. • Safety Requirements for Working with Robots. 	2	4
10.	Risk Management.	a1, a2, b1, c1, c2	<ul style="list-style-type: none"> • Risk Management Cycle. • Hazard Identification. • Job Safety Analysis. • Risk Assessment. • Risk Control. • Accident Investigation. 	2	4
11.	Safety Management Systems.	a1, a2, b1, b2, c1, c2	<ul style="list-style-type: none"> • Concepts and Components of a Health and Safety Management System. • Development of OHSAS18001 and Accreditation. • Safety Auditing. 	1	2

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12.	Final Exam.	a1, a2, b1, b2, c1, c2	• All the Chapters.	1	2
Number of Weeks /and Units Per Semester				16	32

B – Tutorial Aspects:				
Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
1.	The Work Environment and Its Relation to the Safety and Occupational Health Requirements.	1	2	a1, b1
2.	Workplace Exposures and Personal Protective Equipment.	1	2	a1, a2, b1, c1
3.	Material Handling Safety.	1	2	a2, b1, c2
4.	Electrical Safety.	2	4	a1, a2, b1, c1, c2
5.	Chemical Safety.	1	2	a1, a2, b1, c1, c2
6.	Machine Safety.	1	2	a1, a2, b1, c1, c2
7.	Fire Safety.	2	4	a1, a2, b1, c1, c2
8.	Industrial Automation and Robots Safety.	2	4	a1, a2, b1, c1, c2
9.	Risk Management.	2	4	a1, a2, b1, c1, c2
10.	Safety Management Systems.	1	2	a1, a2, b1, b2, c1, c2
Number of Weeks /and Units Per Semester 14			28	

V. Teaching Strategies of the Course:
<p>The teaching strategies of the course are as follows:</p> <ul style="list-style-type: none"> • Active Lectures (supported with discussions) • Tutorials. • Case Studies. • Independent Applications of Engineering Analysis. • Field Visits. • Independent Learning and Work. • Group Learning and Problem-Based Learning. • Computer and Web-Based Learning.

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VI. Assessment Methods of the Course:

The assessment methods of the course are as follows:

- Written Assessments.
- Assignments.
- Presentations.
- Case Studies.

VII. Assignments:

Order	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1.	Regular Home-Works.	a1, a2, b1, b2, c1, c2, d1, d2	1-13	3
2.	Assignments to Assess Ability to Solve Problems and Analyze Results Independently.	a1, a2, b1, b2, c1, c2, d1, d2	1-13	4
3.	Presentations on Selected Topics.	a1, a2, b1, b2, c1, c2, d1, d2	3, 6, 9	4
4.	Mini Projects - Scientific Research Work.	a1, a2, b1, b2, c1, c2, d1, d2	3, 6, 9	4
Total				15

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

Order	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	and Home-Works Assignments.	Throughout the Course	22.5	15%	a1, a2, b1, b2, c1, c2, d1, d2
2.	Mid-Term Exam.	8	22.5	15%	a1, a2, b1, c1, c2
3.	Final Exam.	16	105	70%	a1, a2, b1, b2, c1, c2
Total			150	100%	

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IX. Learning Resources:	
<ul style="list-style-type: none"> Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher). 	
1- Required Textbook(s) (maximum two).	
1. Omar Al-Sakaf, 2016, Introduction to Industrial Safety, 1 st Edition, Sana'a, Yemen.	
2- Essential References.	
<ol style="list-style-type: none"> C. Ray Asfahl & David W. Rieske, 2010, Industrial Safety and Health Management, 6th Edition, NJ-USA, Prentice Hall. David L. Goetsch, 2000, The Safety and Health Handbook, NJ-USA, Prentice Hall. Yemen Occupational Safety and Health Manual (Arabic), 1999, First Edition. National Occupational Health and Safety Legislations in the Republic of Yemen (Arabic), 2001, First Edition. U.S. Department of Labor, OSHA Safety and Health Standards 29 CFR1910, 2010. Hagan, Philip E., Montgomery, John F., O'Reilly, James T., 2009, Accident Prevention Manual for Business & Industry; Administration & Programs, 13th Edition. Itasca, Illinois, National Safety Council. Height, Joel M., 2008, The Safety Professionals Handbook; Technical Applications. Des Plaines Illinois; American Society of Safety Engineers. 	
3- Electronic Materials and Web Sites etc.	
1. Encyclopedia of Occupational Health and Safety. International Labor Office. Comprehensive Reference Work; Source of Practical Information, 2010, www.ilo.org.	

X. Course Policies:	
.1	Class Attendance: The students should have more than 75 % of attendance according to rules and regulations of the Faculty.
.2	Tardy: The students should respect the timing of attending the lectures. They should attend within 10 minutes from starting of the lecture.
.3	Exam Attendance/Punctuality: The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for mid-term exam and final exam.
.4	Assignments & Projects: The assignment is given to the students after each chapter, the student has to submit all the assignments for checking on time.
.5	Cheating: If any cheating occurred during the examination, the student is not allowed to continue and the examination committee for enquiries. he has to face
6.	Plagiarism:

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	The student will be terminated from the Faculty, if one student attends the exam on another university. behalf according to the policy, rules and regulations of the
7.	<p style="text-align: right;">Other Policies:</p> <ul style="list-style-type: none"> All the teaching materials should be kept out the examination hall. The mobile phone is not allowed. There should be a respect between the student and his teacher.

Reviewed By	Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat. President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi. Head of Mechatronics Engineering Department: Assoc. Prof. Dr. Abdul-Malik Momin. Asst. Prof. Dr. Hatem Al-Dois.
	Deputy Rector for Academic Affairs Assoc. Prof. Dr. Ibrahim AlMutaa. Assoc. Prof. Dr. Ahmed Mujahed. Asst. Prof. Dr. Munaser Alsubari.

Course Plan of Industrial Safety

I.Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Prof. Dr. Omar H.Al-Sakaf.	Office Hours					
Location & Telephone No.	Faculty of Engineering. Mobile: 733772328/ 773332328.	SAT	SUN	MON	TUE	WED	THU
E-mail	oalsakaf@gmail.com. oalsakaf@yahoo.com.		08:00 - 12:00				

II.Course Identification and General Information:						
.1	Course Title:	Industrial Safety.				
.2	Course Code & Number:	MT406.				
.3	Credit Hours:	C.H.				TOTAL CR. HRS.
		Th.	Seminar	Pr.	Tu.	
		2	-	-	2	3
.4	Study Level/ Semester at which this Course is offered:	Fifth Year- First Semester.				

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.5	Pre –Requisite (if any):	None.
.6	Co –Requisite (if any):	None.
7.	Program (s) in which the Course is offered:	Mechatronics Engineering Program.
.8	Language of Teaching the Course:	English Language.
.9	System of Study:	Semesters.
.10	Mode of Delivery:	Lectures and Tutorials.
11.	Location of Teaching the Course:	Mechatronics Engineering Department.

III.Course Description:

This course enhances safety awareness of students towards potential hazards in the workplace and provides **them with** useful practical knowledge for workplace safety which is mandated by national and international standards. Students will identify, evaluate and control potential hazards to prevent or mitigate harm or damage to people, property, or the environment. Emphasis is placed on main causes of industrial accidents and protection, risk management and accident prevention, automated systems and robot safety as well as safety management systems.

IV.Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Identify the workplace safety and health hazards and the ways to prevent accidents or injury by controlling these hazards.	A3
a2.	Explain accident and injury information with respect to valid safety standards, state laws and regulations and recognize where and how to get additional safety information.	A7
b1.	Analyze the causes and consequences of industrial safety accidents.	B1
b2.	Classify the national and international applicable safety standards.	B5
c1.	Conduct a job safety analysis and accident investigation.	C1
c2.	Employ a safety and health program.	C5
d1.	Review soft skills, including teamwork, presentation and communication skills.	D1

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d2.	Assess problem solving skills and use computer applications and Internet to extract information related to field of study and to prepare and present reports.	D7
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V.Course Content:				
A – Theoretical Aspects:				
Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1.	The Work Environment and Its Relation to the Safety and Occupational Health Requirements.	<ul style="list-style-type: none"> • Facilities and Workstations. • Maintenance of Plant Facilities. • Industrial Sanitation and Personnel Facilities. • Occupational Health Services. • National and International Safety Codes and Standards. 	1	2
2.	Workplace Exposures and Personal Protective Equipment.	<ul style="list-style-type: none"> • Main Causes of Industrial Accidents and Protection. • Personal Protective Equipment: Function, Types, Selection. 	2	2
3.	Material Handling Safety.	<ul style="list-style-type: none"> • Types of Material Handling (Manual, Mechanized, Automated). • Accidents and Injuries. • Preventive Measures to Reduce Accidents. 	3	2
4.	Electrical Safety.	<ul style="list-style-type: none"> • Potential Hazards of Electricity. • Forms of Electrical Hazards. • Forms of Electric Shock and Protection. • Protective Strategies Against Electrical Hazards. 	4,5	4
5.	Chemical Safety.	<ul style="list-style-type: none"> • Classification of Chemicals and Labeling. • Chemical Accidents. • Preventive Measures. • The International Program on Chemical Safety. 	6	2
6.	Machine Safety.	<ul style="list-style-type: none"> • Potential Hazards of Machines. • Methods of Safeguarding. • Lockout and Tagout. 	7	2

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7.	Mid-Term Exam.	All the Chapters.	8	2
8.	Fire Safety.	<ul style="list-style-type: none"> • Fire Triangle. • Common Fire Hazards. • Fire Protection. • Fire Prevention. • Evacuation. • Fire Fighting. 	9,10	4
9.	Industrial Automation and Robots Safety.	<ul style="list-style-type: none"> • Elements of Automation Safety Systems. • Programmable Automation Controllers. • Safety Communication Networks. • Hazards Associated with Robots. • Safety Requirements for Working with Robots. 	11,12	4
10.	Risk Management.	<ul style="list-style-type: none"> • Risk Management Cycle. • Hazard Identification. • Job Safety Analysis. • Risk Assessment. • Risk Control. • Accident Investigation. 	13,14	4
11.	Safety Management Systems.	<ul style="list-style-type: none"> • Concepts and Components of a Health and Safety Management System. • Development of OHSAS18001 and Accreditation. • Safety Auditing. 	15	2
12.	Final Exam.	All the Chapters.	16	2
Number of Weeks /and Units Per Semester			16	32

B – Tutorial Aspects:				
Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
1.	The Work Environment and Its Relation to the Safety and Occupational Health Requirements.	1	2	a1, b1
2.	Workplace Exposures and Personal Protective Equipment.	2	2	a1, a2, b1, c1

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3.	Material Handling Safety.	3	2	a2, b1, c2
4.	Electrical Safety.	4,5	4	a1, a2, b1, c1, c2
5.	Chemical Safety.	6	2	a1, a2, b1, c1, c2
6.	Machine Safety.	7	2	a1, a2, b1, c1, c2
7.	Fire Safety.	8,9	4	a1, a2, b1, c1, c2
8.	Industrial Automation and Robots Safety.	10,11	4	a1, a2, b1, c1, c2
9.	Risk Management.	12,13	4	a1, a2, b1, c1, c2
10.	Safety Management Systems.	14	2	a1, a2, b1, b2, c1, c2
Number of Weeks /and Units Per Semester		14	28	

VI. Teaching Strategies of the Course:

The teaching strategies of the course are as follows:

- Active Lectures (supported with discussions).
- Tutorials.
- Case Studies.
- Independent Applications of Engineering Analysis.
- Field Visits.
- Independent Learning and Work.
- Group Learning and Problem-Based Learning.
- Computer and Web-Based Learning.

Assignments: VII.

Order	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1.	Regular Home-Works.	a1, a2, b1, b2, c1, c2, d1, d2	1-13	3
2.	Assignments to Assess Ability to Solve Problems and Analyze Results Independently.	a1, a2, b1, b2, c1, c2, d1, d2	1-13	4

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3.	Presentations on Selected Topics.	a1, a2, b1, b2, c1, c2, d1, d2	3, 6, 9	4
4.	Mini Projects - Scientific Research Work.	a1, a2, b1, b2, c1, c2, d1, d2	3, 6, 9	4
Total				15

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

Order	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Home-Works and Assignments.	Throughout the Course	22.5	15%	a1, a2, b1, b2, c1, c2, d1, d2
2.	Mid-Term Exam.	8	22.5	15%	a1, a2, b1, c1, c2
3.	Final Exam.	16	105	70%	a1, a2, b1, b2, c1, c2
Total			150	100%	

IX. Learning Resources:

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

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

- Omar Al-Sakaf, 2016, Introduction to Industrial Safety, 1st Edition, Sana'a, Yemen.

2- Essential References.

- C. Ray Asfahl & David W. Rieske, 2010, Industrial Safety and Health Management, 6th Edition, NJ-USA, Prentice Hall.
- David L. Goetsch, 2000, The Safety and Health Handbook, NJ-USA, Prentice Hall.
- Yemen Occupational Safety and Health Manual (Arabic), 1999, First Edition.
- National Occupational Health and Safety Legislations in the Republic of Yemen (Arabic), 2001, First Edition.
- U.S. Department of Labor, OSHA Safety and Health Standards 29 CFR1910, 2010.
- Hagan, Philip E., Montgomery, John F., O'Reilly, James T., 2009, Accident Prevention Manual for Business & Industry; Administration & Programs, 13th Edition. Itasca, Illinois, National Safety Council.
- Height, Joel M., 2008, The Safety Professionals Handbook; Technical Applications. Des Plaines Illinois; American Society of Safety Engineers.

3- Electronic Materials and Web Sites etc.

- Encyclopedia of Occupational Health and Safety. International Labor Office. Comprehensive reference work; source of practical information, 2010, www.ilo.org.

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X.Course Policies:	
.1	Class Attendance: The students should have more than 75 % of attendance according to rules and regulations of the Faculty.
.2	Tardy: The students should respect the timing of attending the lectures. They should attend within 10 minutes from starting of the lecture.
.3	Exam Attendance/Punctuality: The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for mid-term exam and final exam.
.4	Assignments & Projects: The assignment is given to the students after each chapter, the student has to submit all the assignments for checking on time.
.5	Cheating: If any cheating occurred during the examination, the student is not allowed to continue and he the examination committee for enquiries . has to face
6.	Plagiarism: The student will be terminated from the Faculty, if one student attends the exam on another university. behalf according to the policy, rules and regulations of the
7.	Other Policies: <ul style="list-style-type: none"> • All the teaching materials should be kept out the examination hall. • The mobile phone is not allowed. • There should be a respect between the student and his teacher.

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Prof. Dr.
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