Sana'a University
Faculty of Engineering
Mechanical Engineering Department
Mechanical Engineering Program

36. Course Specification of Probability and Statistics

I. Course Identification and General Information:

1.	Course Title:	Probability and Statistics.				
2.	Course Code & Number:	BR231				
3.	Credit hours:	C.H				TOTAL CR HRS
		Th.	Seminar/Tu	Pr	Tr.	
		2	-	-	-	2
4.	Study level/ semester at which this course is offered:	Third Year –Second Semester				
5.	Pre –requisite (if any):	None				
6.	Co –requisite (if any):	None				
7.	Program (s) in which the course is offered:	B.Sc. Mechanical Engineering Program				
8.	Language of teaching the course:	English Language				
9.	Location of teaching the course:	Department of Mechanical engineering				
10.	Prepared By:	Asst. Prof. Dr. Abdulsalam Almakhlafy				
11.	Date of Approval					

II. Course Description:

This course covers the role of statistics in engineering, probability, discrete random variables and probability distributions, continuous random variables and probability distributions, joint probability distributions, random sampling and data description, point estimation of parameters, statistical intervals for a single sample and tests of hypotheses for a single sample.

	III. Alignment course intended learning outcomes (CILOs)	Referenced PILOs
a1	Recognize how probability and statistics can be used as a very useful tools in many engineering and data management problems relevant to mechanical engineering fields.	A1
a2	Define the basic concepts of probability, random variables, probability distribution, and joint probability distribution.	A4

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

b1	Analyse descriptive statistics data using numerical and graphical techniques.	B1
b2	Examine point estimation of parameters, sampling distributions and the central limit theorem.	B3
c1	Use statistics computer software to solve the probability and statistics problems.	C1
c2	Calculate the probability and statistics variables and to make important decisions from few samples which are taken out of unmanageably huge populations.	C2
d1	Estimate confidence intervals on parameters for a single sample.	D2
d2	Estimate histogram tables and diagram for data and interprets it.	D2

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

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Recognize how probability and statistics can be used as a very useful tools in many engineering and data management problems relevant to mechanical engineering fields.	Lectures, Interactive Class Discussions	Examinations Homework
a2- Define the basic concepts of probability, random variables, probability distribution, and joint probability distribution.	Lectures, Interactive Class Discussions	Examinations Homework

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

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Analyse descriptive statistics data using numerical and graphical techniques.	Lectures, Interactive Class Discussions	Examinations, homework, Class Attendance

Head of Department Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

b2- Examine point estimation of parameters, sampling distributions and the central limit theorem.	Lectures, Interactive Class Discussions	Examinations, homework, Class Attendance

© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1- Use statistics computer software to solve the probability statistics problems.	Lectures, Interactive Class Discussions, Statistics Computer Software (Excel & SPSS)	Examinations, Homework, Class Attendance
c2- Calculate the probability and statistics variables and to make important decisions from few samples which are taken out of unmanageably huge populations.	Lectures, Interactive Class Discussions, Statistics Computer Software (Excel & SPSS)	Examinations, Homework, Class Attendance

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Estimate confidence intervals on parameters for a single sample.	Lectures, Interactive Class Discussions	Examinations Homework, Class Attendance
d2- Estimate histogram tables and diagram for data and interprets it.	Lectures, Interactive Class Discussions	Examinations Homework, Class Attendance

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours

1	Introduction to Statistics and Data Analysis	a1,a2,c2	▪ Overview: Statistical Inference, Samples, Populations, and the Role of Probability ▪ Sampling Procedures; Collection of Data Measures of Location: ▪ The Sample Mean and Measures of Variability	1	2
2	Introduction to Statistics and Data Analysis	a1, a2, b1,b2	▪ Discrete and Continuous Data Statistical Modeling, Scientific Inspection, and Graphical Diagnostics ▪ General Types of Statistical Studies: Designed Experiment, ▪ Observational Study, and Retrospective Study	1	2
3	Probability	a2,b1,b2,c1,c2	▪ Sample Space ▪ Events ▪ Counting Sample Points	1	2
4	Probability	a2, b1,b2, c1,c2	▪ Probability of an Event ▪ Additive Rule ▪ Conditional Probability, Independence, and the Product Rule	1	2
5	Random Variables and Probability Distributions	a2,b1	▪ Concept of a Random Variable ▪ Bayes' Theorem and Random Variables ▪ Discrete Probability Distributions	1	2
6	Random Variables and Probability Distributions	b1,b2, c1, c2	▪ Continuous Probability Distributions ▪ Joint Probability Distributions	1	2
7	Mathematical Expectation	a1, a2,,b1, b2,c1,c2	▪ Mean of a Random Variable ▪ Variance and Covariance of Random Variables	1	2
8	Mid Term Exam.	a1, a2,,b1, b2,c1,c2	▪ All Previous Topics	1	2

8	Mathematical Expectation	b2	▪ Means and Variances of Linear Combinations of Random Variables ▪ Chebyshev's Theorem	1	2
9	Some Discrete Probability Distributions	b2,c1,c2	▪ Introduction and ▪ Binomial and Multinomial Distributions	1	2
10	Some Discrete Probability Distributions	a2,b1, b2, c1,c2	▪ Hypergeometric Distribution ▪ Negative Binomial and Geometric Distributions ▪ Poisson Distribution and the Poisson Process	1	2
11	Some Continuous Probability Distributions	b1,b2,c1,c2	▪ Continuous Uniform Distribution ▪ Normal Distribution ▪ Areas under the Normal Curve ▪ Applications of the Normal Distribution	1	2
12	Some Continuous Probability Distributions	a2	▪ Normal Approximation to the Binomial ▪ Gamma and Exponential Distributions ▪ Chi-Squared Distribution ▪ Beta Distribution ▪ Lognormal Distribution	1	2
13	Fundamental Sampling Distributions and Data Descriptions	a1,a2,b1,b2, c1,c2, d1,d2	▪ Random Sampling ▪ Some Important Statistics ▪ Sampling Distributions ▪ Sampling Distribution of Means and the Central Limit Theorem.	1	2
14	One- and Two-Sample Estimation Problems	a1,a2,b1,b2, c1,c2, d1,d2	▪ Introduction ▪ Statistical Inference ▪ Classical Methods of Estimation ▪ Single Sample: Estimating the Mean	1	2

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

			▪ Standard Error of a Point Estimate ▪ Prediction Intervals ▪ Tolerance Limits		
15	Final Exam	a1,a2,b1,b2, c1,c2, d1,d2	▪ All Topics	1	2
Number of Weeks /and Units Per Semester				**16**	**32**

V. Teaching strategies of the course:

- Lectures,
- Interactive Class Discussions
- Statistics Computer Software (Excel & SPSS)

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Homework	a1,a2,b1,b2,c1,c2,d1,d2	Weekly	10
2	Statistics Computer Software (Excel & SPSS)	c1,c2	Weekly	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	Weekly	15	15%	a1,a2,b1,b2,c1,c2,d1,d2
2	Quizzes	5th & 11th weeks	5	5%	a1,a2,b1,b2,c1,c2,d1,d2
3	Mid-Term Exam	8th week	20	20%	a1,a2,b1,b2,c1,c2
4	Final Exam	16th week	60	60%	a1,a2,b1,b2, c1,c2, d1,d2
Total			**100**	**100%**	

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

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. Ronald E. Walpole, R, H. Myers, Sh. L. Myers, Keying Ye, 2012, Probability & Statistics for Engineers & Scientists, 9th Edition, Prentice Hall.
2. Hodges, J. L., and Lehmann, E. L. 2005, Basic Concepts of Probability and Statistics, 2nd Edition. Philadelphia.

2- Essential References.

1. Ross, S. M. (2002). Introduction to Probability Models, 9th Ed. New York: Academic Press, Inc.
2. Montgomery, D. C. 2008, Introduction to Statistical Quality Control, 6th Ed. New York: John Wiley & Sons.

3- Electronic Materials and Web Sites *etc.*

1- Statistical Computer Software

I. Course Policies:

1	**Class Attendance:** - The student should be attending not less than 75% of total contact hours of the subject, otherwise he will not able to take exam and be considerd as an exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic.
2	**Tardy:** - For lateness in attending the class, the student will be initially notified. If he repeates late in attending class he will be considered absent.
3	**Exam Attendance/Punctuality:** - The student should attend the exam on time. He is permitted to attend the exam half one hour from exam beginning, after that he/she will not be permitted to take exam and he/she is considered absent in the exam.
4	**Assignments & Projects:** - In general one assignment is given after each chapter of a course. The student should submit the assignment on time, mostly one week after giving the assignment
5	**Cheating**: - For cheating in exam, the student is considered as failure. In case the cheating is repeated three times during study the student will be disengaged from the Faculty
6	**Plagiarism**:

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

	Plagiarism is the attending of the student the exam of a course instead of other student. If the examination committee proved 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 Affair Council of the university.
7	**Other policies:** - The mobile phone is not allowable to be used during class lecture. It must be switched off, otherwise the student will be ordered to leave the lecture room. - The mobile phone is not allowed to be taken during the examination time. - Lecture notes and assignments may be given directly to students using soft or hard copy.

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 Name of Reviewer from the Department: Assoc.Prof. Dr. Khalil Al-Hatab
	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa Assoc. Prof. Dr. Ahmed Mujahed Asst. Prof. Dr. Munasar Alsubri

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

36. Course Plan of Probability and Statistics

I. Information about Faculty Member Responsible for the Course:

Name of Faculty Member	Dr. Abdulsalam Almakhlafy	**Office Hours**					
Location& Telephone No.		**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**
E-mail							

II. Course Identification and General Information:

1.	Course Title:	Probability and Statistics.				
2.	Course Number & Code:	BR231				
3.	Credit hours:	C.H				TOTAL CR HRS
		Th.	Seminar/Tu	Pr	Tr.	
		2	-	-	-	2
4.	Study level/year at which this course is offered:	Third Year –Second Semester.				
5.	Pre –requisite (if any):	None.				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered	Mechanical Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	System of Study:	Semesters.				
10.	Mode of delivery:	Lectures.				
11.	Location of teaching the course:	Mechanical Engineering Department.				

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

III. Course Description:

This course covers the role of statistics in engineering, probability, discrete random variables and probability distributions, continuous random variables and probability distributions, joint probability distributions, random sampling and data description, point estimation of parameters, statistical intervals for a single sample and tests of hypotheses for a single sample.

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

- Brief summary of the knowledge or skill the course is intended to develop**:**

1. Recognize how probability and statistics can be used as a very useful tools in many engineering and data management problems relevant to mechanical engineering fields.
2. Define the basic concepts of probability, random variables, probability distribution, and joint probability distribution.
3. Analyse descriptive statistics data using numerical and graphical techniques.
4. Examine point estimation of parameters, sampling distributions and the central limit theorem.
5. Use statistics computer software to solve the probability and statistics problems.
6. Calculate the probability and statistics variables and to make important decisions from few samples which are taken out of unmanageably huge populations.
7. Estimate confidence intervals on parameters for a single sample.
8. Estimate histogram tables and diagram for data and interprets it.

V. Course Content:

- Distribution of Semester Weekly Plan Of course Topics/Items and Activities.

A – Theoretical Aspect:

Order	Topics List	Sub Topics List	Week Due	Contact Hours
1	Introduction to Statistics and Data Analysis	▪ Overview: Statistical Inference, Samples, Populations, and the Role of Probability ▪ Sampling Procedures; Collection of Data Measures of Location: ▪ The Sample Mean and Measures of Variability	1st week	2
2	Introduction to Statistics and Data Analysis	▪ Discrete and Continuous Data Statistical Modeling, Scientific Inspection, and Graphical Diagnostics ▪ General Types of Statistical Studies: Designed Experiment, ▪ Observational Study, and Retrospective Study	2nd week	2
3	Probability	▪ Sample Space ▪ Events ▪ Counting Sample Points	3rd week	2
4	Probability	▪ Probability of an Event ▪ Additive Rule ▪ Conditional Probability, Independence, and the Product Rule	4th week	2
5	Random Variables and Probability Distributions	▪ Concept of a Random Variable ▪ Bayes' Theorem and Random Variables ▪ Discrete Probability Distributions	5th week	2
6	Random Variables and Probability Distributions	▪ Continuous Probability Distributions ▪ Joint Probability Distributions	6th week	2
7	Mathematical Expectation	▪ Mean of a Random Variable ▪ Variance and Covariance of Random Variables	7th week	2
8	Mid Term Exam.	▪ All Previous Topics	8th week	2

9	Mathematical Expectation	▪ Means and Variances of Linear Combinations of Random Variables ▪ Chebyshev's Theorem	9th week	2
10	Some Discrete Probability Distributions	▪ Introduction and ▪ Binomial and Multinomial Distributions	10th week	2
11	Some Discrete Probability Distributions	▪ Hypergeometric Distribution ▪ Negative Binomial and Geometric Distributions ▪ Poisson Distribution and the Poisson Process	11th week	2
12	Some Continuous Probability Distributions	▪ Continuous Uniform Distribution ▪ Normal Distribution ▪ Areas under the Normal Curve ▪ Applications of the Normal Distribution	12th week	2
13	Some Continuous Probability Distributions	▪ Normal Approximation to the Binomial ▪ Gamma and Exponential Distributions ▪ Chi-Squared Distribution ▪ Beta Distribution ▪ Lognormal Distribution	13th week	2
14	Fundamental Sampling Distributions and Data Descriptions	▪ Random Sampling ▪ Some Important Statistics ▪ Sampling Distributions ▪ Sampling Distribution of Means and the Central Limit Theorem.	14th week	2
15	One- and Two-Sample Estimation Problems	▪ Introduction ▪ Statistical Inference ▪ Classical Methods of Estimation ▪ Single Sample: Estimating the Mean ▪ Standard Error of a Point Estimate ▪ Prediction Intervals ▪ Tolerance Limits	15th week	2
16	Final Exam	All Topics	16th week	2

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

Number of Weeks /and Units Per Semester	**16**	**32**

VI. Teaching strategies of the course:

- Lectures,
- Interactive Class Discussions
- Statistics Computer Software (Excel & SPSS)

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Homework	a1,a2,b1,b2,c1,c2,d1,d2	Weekly	10
2	Statistics Computer Software (Excel & SPSS)	c1,c2	Weekly	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	Weekly	15	15%
2	Quizzes	5^{th} & 11^{th} weeks	5	5%
3	Mid-Term Exam	8^{th} week	20	20%
4	Final Exam	16^{th} week	60	60%
Total			**100**	**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).

1. Ronald E. Walpole, R, H. Myers, Sh. L. Myers, Keying Ye, 2012, Probability & Statistics for Engineers & Scientists, 9^{th} Edition, Prentice Hall.

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

2. Hodges, J. L., and Lehmann, E. L., 2005, Basic Concepts of Probability and Statistics, 2nd Ed., Philadelphia: Society for Industrial and Applied Mathematics.
2- Essential References.
1. Ross, S. M. ,2002, Introduction to Probability Models, 9th Ed. New York: Academic Press, Inc. 2. Montgomery, D. C. ,2008, Introduction to Statistical Quality Control, 6th Ed. New York: John Wiley & Sons.
3- Electronic Materials and Web Sites *etc*.
1- Statistical Computer Software

II. Course Policies:

1	**Class Attendance:** - The student should be attending not less than 75% of total contact hours of the subject, otherwise he will not able to take exam and be considerd as an exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic.
2	**Tardy:** - For lateness in attending the class, the student will be initially notified. If he repeates late in attending class he will be considered absent.
3	**Exam Attendance/Punctuality:** - The student should attend the exam on time. He is permitted to attend the exam half one hour from exam beginning, after that he/she will not be permitted to take exam and he/she is considered absent in the exam.
4	**Assignments & Projects:** - In general one assignment is given after each chapter of a course. The student should submit the assignment on time, mostly one week after giving the assignment
5	**Cheating**: - For cheating in exam, the student is considered as failure. In case the cheating is repeated three times during study the student will be disengaged from the Faculty
6	**Plagiarism**: Plagiarism is the attending of the student the exam of a course instead of other student. If the examination committee proved 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 Affair Council of the university.
7	**Other policies:**

Head of Department Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

	- The mobile phone is not allowable to be used during class lecture. It must be switched off, otherwise the student will be ordered to leave the lecture room. - The mobile phone is not allowed to be taken during the examination time. - Lecture notes and assignments may be given directly to students using soft or hard copy.

37. Course Specification of Computer Programming & Applications

I. Course Identification and General Information:

1.	Course Title:	Computer Programming & Applications.				
2.	Course Code & Number:	ME201				
3.	Credit hours:	C.H				TOTAL CR. HRS.
		Th.	Seminar/Tu	Pr	Tr.	
		2	-	2	-	3
4.	Study level/ semester at which this course is offered:	Third Year-Second Semester.				
5.	Pre –requisite (if any):	Computer Skills.				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered:	Mechanical Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	Location of teaching the course:	Mechanical Engineering Department.				
10.	Prepared By:	Assoc. Prof. Dr. Radwan Al bouthigy				
11.	Date of Approval:					

II. Course Description:

This course introduces mechanics engineer basic principles and concepts required to solve problems using computer programming. Subjects for the course include an introduction to computer programming, problem solving, building simple structured program based on functions using C/C++ programming language and MATLAB software. The objective of the course is to develop the programming skills of mechanic students to solve problems using C++ programming language and MATLAB m-files. Laboratory works include the working on C++

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

Language and MATLAB environments to build simple structured programming for solving different problems. Finally, students may work on group to demonstrate, solve, and presents solutions to simple mechanical practices in programming.

III. Alignments course intended learning outcomes (CILOs) of the course		Referenced PILOs
a1	Illustrate knowledge & understanding of basic programming principles and concepts relevant to mechanical engineering.	A1
a2	Explain the working principles and applications of C++ and MATLAB programming environments in solving problems relevant to mechanical engineering.	A4
b1	Investigate the principles of structured programming to model and solve mechanical problems using C++ and MATLAB environments in innovative ways.	B1
c1	Use C/C++ and MATLAB working environments to design, debug, and build structured program for solving mechanical engineering practice.	C1
c2	Apply rules and regulations of industrial safety while solving mechanical engineering practices in programming.	C3
d1	Evaluate the needs for programming solving to problems using C/C++ and MATLAB, or any modern programming environment as a life-long learning.	D3

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Illustrate knowledge & understanding of basic programming principles and concepts relevant to mechanical engineering.	Lectures, Laboratory, Seminars.	Examinations, Laboratory Reports, Homework Presentations
a2- Explain the working principles and applications of C++ and MATLAB programming environments in solving problems relevant to mechanical engineering.	Lectures, Projects.	Examinations, Homework Presentations, Individual and Group Project Reports

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Investigate the principles of structured programming to model and solve mechanical problems using C++ and MATLAB environments in innovative ways.	Lectures, Tutorials, Laboratory, Seminars. Projects	Examinations, Homework Presentations, Individual and Group Project Reports Laboratory Reports Presentations,

© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1- Use C/C++ and MATLAB working environments to design, debug, and build structured program for solving mechanical engineering practice.	Lectures, Laboratory, Seminars. Projects, Small Group	Examinations, Laboratory Reports, Presentations, Individual and Group Project Reports
c2- Apply rules and regulations of industrial safety while solving mechanical engineering practices in programming.	Tutorials, Laboratory, Seminars. Projects, Small Group	Examinations, Laboratory Reports, Presentations, Individual and Group Project Reports

(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 the needs for programming solving to problems using C/C++ and MATLAB, or any modern programming environment as a life-long learning.	Seminars, Problems Based Learning, Projects.	Presentations, Reports

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1.	Course Orientations and Introduction	a1, a2, d1	• Course Orientations, • Introduction to Programming Language and their Applications.	1	2
2.	Problem Solving Using Programming and Input/ Output	a1, a2, b1	• How to Solve Problems Using Programming? • Waterfall Model Steps to Design and Construct C/C++ Program,	2	4

	Functions in C/C++		• Use of Flow-Chart Diagram and Pseudo Code • Problem Solving Steps of Mathematical Equation, • Basic Input/ Output Functions, • Simple C/C++ program • Program Layout and its Components • Variables Declarations, • Constraint on Variables Naming and Syntax		
3.	Conditional Statements	a1, a2, b1, c2	• Arithmetic and Logic Operators Used in C/C++, • How to Write Mathematical & Logical Expressions in C/C++, • Break Word Operation, • Examples	2	4
4.	Loops in C/C++	a1, a2, b1, c2	• Loops in C/C++, • Examples, • While Loop and Do While Loop Operations and Application • Examples.	2	4
5.	Mid-Term Examination (Theoretical)	a1, a2, b1, c2, d1	All Previous Topics	1	2
6.	Functions in C/C++	a1, a2, b1, c2, d1	• Explanation the Use of Functions to Build Complete Structured Program, • Input, Output, and Retuned Variables/Values • Examples	1	2
7.	Getting Starting with MATLAB, Variables, Functions, Flow Control,	a1, a2, b1, c2, d1	• Getting Start Working and Programming in MATLAB Environment, • Scripts (m-Files) in MATLAB • Explanation Similarities and Differences Between the	2	4

	and Basic Plotting.		Program in C/C++ and MATLAB, • Variables in MATLAB, • If Statement Syntax in MATLAB • Loops and Functions Syntax in MATLAB • Basic Plotting in MATLAB.		
8.	Visualization and Solving Equations & Curve Fitting in MATLAB,	a2, b1, c2, d1	• Input / Output Dialog, • Line Plots, • Image/Surface Plots, • Arrays & Vectorization, • Solving Equations in MATLAB, • Linear Algebra, • Polynomials, • Differentiation/Integration, and • Differential Equations.	2	4
9.	Advanced Programming Methods in MATLAB	a2, b1, c2, d1	• Symbolic Math, • Simulink, • File/Image Input/ Output, • Graphical User Interface	2	4
10.	Final Exam	a1, a2, b1, c2, d1	ALL Topics	1	2
Number of Weeks /and Units Per Semester				**16**	**32**

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact hours	Learning Outcomes
1.	• **Getting Start Working with C/C++ Environment,** • **How to Make C/C++ Program File?** • **Building and Compiling it,**	**3**	**6**	**a1, a2, c1, d1**

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

	• **Building Simple C/C++ Program of Input/ Output Functions in C/C++, and Their Associated Libraries,** • **Solving Mathematical Equations in C++,** • **Design and Implementation of Simple I/O Program** • **Input Values (keyboard),** • **Output Results (Screen).**			
2.	• **Design & Implementation of Simple C++ Conditional Program to Verify the Operation of If Statement and Switch.. Statement and the Break Keyword**	**2**	**4**	**a2, c1, c2, d1**
3.	• **Programming with Loops in C++,** • **Design & Implementation of Simple C++ Program that Illustrate the Operation of Loop Statements**	**2**	**4**	**a2, c1, c2, d1**
4.	• **Design and Implementation of Structured Program in C++ Using Functions,**	**1**	**2**	**b1, c1, c2, d1**
5.	• **Starting with MATLAB,** • **MATLAB Working Environment,** • **Creating Manuscripts (m-Files) in MATLAB,** • **Manipulating Variables, Flow-Control Statements, Loops and Functions, Simple Line Plotting**	**2**	**4**	**a2, b1, c1, c2, d1**
6.	• **Use MATLAB to Implement Programs that Illustrates the Following Concepts: Visualizations, Arrays (Vectorizations), Plotting, Manipulating Different Math Functions,** • **Reading and Writing Files/Images,** • **Simulink, and** • **Graphical User Interface in MATLAB.**	**2**	**4**	**b1, c1, c2, d1**

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

7.	• **Project Report Presentations,**	**1**	**2**	**a2, b1, c1, c2, d1**
8.	• **Final Examination (Practical)**	**1**	**2**	**a1, a2, b1, c1, c2, d1**
ımber of Weeks /and Units Per Semester		**14**	**28**	

V. Teaching strategies of the course:

- Lectures,
- Tutorials,
- Laboratory,
- Seminars.
- Problems Based Learning, and
- Projects

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Problem Solving Assignment	**a1, a2, b1, c1, c2, d1**	3rd week	2
2	Flow Control Statements in C++	**a2, c1, c2, d1**	4th & 5th weeks	2
3	Loop Statements in C++	**a2, c1, c2, d1**	6th & 7th weeks	2
4	Functions in C++	**a2, b1, c1, c2, d1**	9th week	2
5	Flow Control, Loops and Functions in MATLAB	**a1, a2, b1, c1, c2, d1**	10th & 11th weeks	2
6	Visualizations, Vectorizations, Equation Solving in MATLAB	**a2, b1, c1, c2, d1**	12th & 13th weeks	2
7	Simulink & GUI in MATLAB	**a2, b1, c1, c2, d1**	14th & 15th weeks	3
8	Homework	**a1,a2.b1,c2,d1**	Weekly	10
Total				**25**

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: Computer Based Laboratory Work & Homework	Weekly	25	16.7 %	**a1, a2, b1, c1, c2, d1**
2	Project Presentations	13th week	10	6. 7 %	**a2, b1, c1, c2, d1**
3	Mid-Term Exam (Theory)	8th week	20	13.3 %	**a1, a2, b1, c2, d1**
4	Final Exam (Practical)	14th week	20	13.3 %	**a1, a2, b1, c1, c2, d1**
5	Final Exam (Theory)	16th week	75	50 %	a1, a2, b1, c2, d1
Total			**150**	**100 %**	

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- Paul Deitel, Harvey Deitel, 2010, How to Program using C/C++ - 5th Edition- USA Pearson.
2- Peter I. Kattan, 2008, MATLAB for Beginners: A Gentle Approach- Revised Edition-Petra Books, ISBN:978-1438203096.

2- Essential References.

1- Bjarne Strousttrup, 2013- the C++ Programming Language- 4th edition- USA-Add Wesley Professional.
2- Brian R, Hunt Roland L, Lipsman, Jonathan M- 2014 - A Guide in MATLA Beginners and Experienced Users- 3rd Edition- Amazon.

3- Electronic Materials and Web Sites *etc*.

1- To get MATLAB student Version, https://msca.mit.edu/cgi-bin/matlab
2- https://mathworks.com/MATLAB
3- http://nptel.iitm.ac.in
4- https://ocw.mit.edu/courses.

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

	5- Lectures will be prepared by lecturer-

III. Course Policies:

1	**Class Attendance:** - The student should be attending not less than 75% of total contact hours of the subject, otherwise he will not able to take exam and be considerd as an exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic.
2	**Tardy:** - For lateness in attending the class, the student will be initially notified. If he repeates late in attending class he will be considered absent.
3	**Exam Attendance/Punctuality:** - The student should attend the exam on time. He is permitted to attend the exam half one hour from exam beginning, after that he/she will not be permitted to take exam and he/she is considered absent in the exam.
4	**Assignments & Projects:** - In general one assignment is given after each chapter of a course. The student should submit the assignment on time, mostly one week after giving the assignment
5	**Cheating**: - For cheating in exam, the student is considered as failure. In case the cheating is repeated three times during study the student will be disengaged from the Faculty
6	**Plagiarism**: Plagiarism is the attending of the student the exam of a course instead of other student. If the examination committee proved 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 Affair Council of the university.
7	**Other policies:** - The mobile phone is not allowable to be used during class lecture. It must be switched off, otherwise the student will be ordered to leave the lecture room. - The mobile phone is not allowed to be taken during the examination time. - Lecture notes and assignments may be given directly to students using soft or hard copy.

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 Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

	Name of Reviewer from the Department: Assoc.Prof. Dr. Khalil Al-Hatab
	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa Assoc. Prof. Dr. Ahmed Mujahed Asst. Prof. Dr. Munasar Alsubri

Head of Department Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

Head of Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas