# Course Specifications

| | |
|---|---|
| **Course Title:** | Ordinary Differential Equations |
| **Course Code:** | 42041222 |
| **Program:** | B. Sc in Mathematics |
| **Department:** | Department of Mathematics |
| **College:** | Faculty of Science and Arts in Qilawah |
| **Institution:** | AlBaha University |

جامعة الباحة
مكتب العميد
كلية العلوم والآداب بقلوة

## Table of Contents

## A. Course Identification

| |
|---|
| **1. Credit hours:** 3(4) hours per week |
| **2. Course type**<br>**a.** University ☐ College ☐ Department ☑ Others ☐<br>**b.** Required ☑ Elective ☐ |
| **3. Level/year at which this course is offered: 4**st Level , 2st year students |
| **4. Pre-requisites for this course** (if any)**: Differential &Integral (2)( 42041223)** |
| **5. Co-requisites for this course** (if any)**:**<br>Partial Differential Equations(42041317),Numerical Analysis (42041313) |

**6. Mode of Instruction** (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | **Traditional classroom** | √ | 75% |
| 2 | **Blended** | √ | 25% |
| 3 | **E-learning** | – | – |
| 4 | **Correspondence** | – | – |
| 5 | **Other** | – | – |

**7. Actual Learning Hours** (based on academic semester)

| No | Activity | Learning Hours |
|---|---|---|
| **Contact Hours** | | |
| 1 | **Lecture** | 30 |
| 2 | **Laboratory/Studio** | – |
| 3 | **Tutorial** | 30 |
| 4 | **Others** (specify) | – |
| | **Total** | 60 |
| **Other Learning Hours*** | | |
| 1 | **Study** | |
| 2 | **Assignments** | |
| 3 | **Library** | |
| 4 | **Projects/Research Essays/Theses** | |
| 5 | **Others** (specify) | |
| | **Total** | |

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes

### 1. Course Description

This course deals with the definitions and concepts of ordinary differential equations and their relation to other sciences and how they are formed. Then different types of equations were solved such as the separable equation, homogeneous equation, exact equation, linear equation, Bernoulli's equation and Ricatti's equation. Also it addresses the most important applications of these equations in different areas. As well as the solution of higher order ordinary linear differential equations with constant coefficients and variable coefficients. Finally solving some ordinary differential equations using series.

### 2. Course Main Objective

1. What is the main purpose for this course?

- To provide basic terminologies on the theory of ordinary differential equations.
- To proceed to diverse methods of solving various types of ordinary differential equations.
- To give some applications related to other sciences such as physics, chemics and biology.

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

- Follow-up studies of contemporary finds, based on modern theories.
- Increasing use of references and the Internet in the collection of knowledge
- Provide resources that are difficult to be provided in the library of Faculty / university

### 3. Course Learning Outcomes

| | CLOs | Aligned PLOs |
|---|---|---|
| 1 | **Knowledge:** | |
| 1.1 | Recognize the types of all ordinary differential equations and classify them by order, degree and linearity | |
| 1.2 | Be familiar with the different methods useful to solve some ordinary differential equations of first and second order. | |
| 1.3 | The importance of ordinary differential equations of higher order and its applications in mathematics, physics and chemistry | |
| 1.4 | Learning the student how to face the problems related to mathematics in the basic sciences, engineering sciences and computer sciences. | |
| **2** | **Skills :** | |
| 2.1 | Recognize the types of all O.D.Es, and classify them by order; degree and linearity. | |
| 2.2 | Apply different methods and techniques to solve some O.D.Es. | |
| 2.3 | Solve a class of O.D.Es by series method. | |

| CLOs | | Aligned PLOs |
|---|---|---|
| **3** | **Competence:** | |
| 3.1 | Communicate, listen, and negotiate as members of a team. | |
| 3.2 | Study, learn and work independently. | |
| 3.3 | Work effectively in groups and teams. | |
| **4.0** | **Communication, Information Technology, Numerical** | |
| 4.1 | The student must have the ability to apply basic knowledge of mathematics in solving differential equations. | |
| 4.2 | The student must appraise for using the library and internet. | |
| 4.3 | Use of computer in problem solving exercises in differential equations. | |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | Definition of ordinary differential equations (O.D.E) and their relationship to other sciences: classification by order and degree, classification as linear and non linear. | 4 |
| 2 | Solutions of O.D.E (general solutions and particular solutions). Initial and boundary value problems. Forming an O.D.E by the elimination of arbitrary constants. | 4 |
| 3 | Solving first order O.D.E : Separable equation, Homogeneous equation, Exact equation, linear equation, Bernoulli's equation, Ricatti's equation. | 16 |
| 4 | Application of first order O.D.E : mathematical applications, physical applications, chemical applications,…. | 4 |
| 5 | Solving linear second order O.D.E with constant coefficients (Homogeneous equations and Non-Homogeneous equations). | 8 |
| 6 | Solving linear higher order O.D.E with constant coefficients (Homogeneous equations and Non-Homogeneous equations) and its applications | 8 |
| 7 | Solving linear second order O.D.E with variable coefficients. Example: Cauchy-Euler equation. | 8 |
| 8 | Solving O.D.E using series method. | 8 |
| **Total** | | 60 |

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| **1.0** | **Knowledge** | | |
| 1.1 | Recognize the types of all ordinary differential equations and classify them by order, degree and linearity | • Introduce new concepts in simple forms in the lectures.<br>• Provide more examples.<br>• In the tutorial activities, exercises are chosen rigorously and discussion with students is very important to clarify some difficulties.<br>• Oral questions in the beginning of every lecture and homework assignments in the end assure the continuity of student works.<br>▪ Team work | • Homework<br>• Assignments,<br>• Quizzes,<br>• Mid-term<br>• Exams<br>• Final exams<br>Class Participation |
| 1.2 | Be familiar with the different methods useful to solve some ordinary differential equations of first and second order. | | |
| 1.3 | The importance of ordinary differential equations of higher order and its applications in mathematics, physics and chemistry | | |
| 1.4 | Learning the student how to face the problems related to mathematics in the basic sciences, engineering sciences and computer sciences. | | |
| **2.0** | **Skills** | | |
| 2.1 | Recognize the types of all O.D.Es, and classify them by order; degree and linearity. | • Lectures and class discussion<br>• Examples and problems to be solved during the lecture<br>• Office hours and individual meetings with students | • Group assignments<br>• Short quizzes<br>• Mid-Term and final exams<br>• Class participation |
| 2.2 | Apply different methods and techniques to solve some O.D.Es. | | |
| 2.3 | Solve a class of O.D.Es by series method. | | |
| **3.0** | **Competence** | | |
| 3.1 | Communicate, listen, and negotiate as members of a team. | • Questions and heavy discussions during lectures.<br>• Group assignments. | • Quizzes of some past lectures.<br>• Discussions in the class during the lecture |
| 3.2 | Study, learn and work independently. | | |
| 3.3 | Work effectively in groups and teams. | | |
| **4.0** | **Communication, Information Technology, Numerical** | | |
| 4.1 | The student must have the ability to apply basic knowledge of mathematics in solving differential equations. | Creating working groups with peers to collectively solve | Discussing the group work with data sheets. |

| | | | |
|---|---|---|---|
| | | problems | |
| 4.2 | The student must appraise for using the library and internet. | Encouraging the student to take help of lecturer if needed. | Give homework's to know how the student understands the numerical skills. |
| 4.3 | Use of computer in problem solving exercises in differential equations. | Give the students tasks to measure their: mathematical skills, computational analysis and problem solving. | Discussions with them regarding the results of computations analysis and solutions of the problems |

### 2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---|---|---|
| 1 | Solving exercise and homework's | Every week | **10%** |
| 2 | Periodic exam 1 | 5th week | **10%** |
| 3 | mid-term exam | 9th week | **20%** |
| 4 | Periodic exam 2 | 13th week | **10%** |
| 5 | Final exam | after 15th week | **50%** |

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**

- Follow-up by the head of the department.
- Define 6 office hours per week for each member of the faculty who resides in his office.
- Define 2 hours weekly as Academic guidance for each faculty member for guiding a group of students academically.
- Give guidance so encouraging in assessing the performance of a teacher.
- Creating the means to make the teacher benefit of his time during his stay in office.

Non-scientific services to assist the teacher to attend office hours.

## F. Learning Resources and Facilities

## 1.Learning Resources

| | |
|---|---|
| **Required Textbooks** | **[1] - S. L. Ross, Introduction to Ordinary Differential Equations, John Wiley, New York (1998).**<br>**[2] - M. R. Spiegel, Applied Differential Equations, Prentice Hall, Inc., New Jersey, (1981).** |
| **Essential References Materials** | **[1] - R. K. Nagle, E. B. Saff and A. D. Snider, Fundamentals of Differential Equations and Boundary Value Problems, Addison-Wesley Longman, (2000).** |
| **Electronic Materials** | *http://www.google.com*. |
| **Other Learning Materials** | CD containing the scientific subject of the course |

## 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation**<br>(Classrooms, laboratories, demonstration rooms/labs, etc.) | Lecture rooms must be around 25 students |
| **Technology Resources**<br>(AV, data show, Smart Board, software, etc.) | Required Data show device to view some of the articles that have been<br>Downloaded from other universities.<br>Display topics curriculum by power point program |
| **Other Resources**<br>(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | — |

# G. Course Quality Evaluation

| |
|---|
| 1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching<br>Student levels<br>Follow the level of students<br>Continuous assessment |
| 2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department<br>Analyzing the results of the students.<br>Workshops within the department.<br>Seminars within the department. |
| 3 Processes for Improvement of Teaching<br>Hard to use means of relating the course, such as references and Computer.<br>Taking the recommendations of the results of the internal and external audit, especially in this course |

| |
|---|
| Follow new.<br>Material and moral incentives |
| 4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)<br>Check marking by an independent faculty member for a sample of student Work.<br>The professor scheduled exchange of correct sample assignments periodically with another faculty member. |
| 5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.<br>Comparison a similar course in the corresponding faculties of other universities.<br>Workshops for teachers scheduled<br>Periodic meetings with students<br>Statistical results to evaluate students with the course and benefit from the results in the improvement and development of scheduled. |

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Strategies for Obtaining Student Feedback on Effectiveness of Teaching | Student levels<br>Follow the level of students<br>Continuous assessment | Direct |
| Other Strategies for Evaluation of Teaching by the Instructor or by the Department | Analyzing the results of the students.<br>Workshops within the department.<br>Seminars within the department. | Direct |
| Processes for Improvement of Teaching | Hard to use means of relating the course, such as references and Computer.<br>Taking the recommendations of the results of the internal and external audit, especially in this course | Direct |

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| | Follow new.<br>Material and moral incentives | |
| Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) | Check marking by an independent faculty member for a sample of student Work.<br>The professor scheduled exchange of correct sample assignments periodically with another faculty member. | Direct |
| Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. | Comparison a similar course in the corresponding faculties of other universities.<br>Workshops for teachers scheduled<br>Periodic meetings with students<br>Statistical results to evaluate students with the course and benefit from the results in the improvement and development of scheduled. | Direct |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

| | |
|---|---|
| **Council / Committee** | |
| **Reference No.** | |
| **Date** | |

# Course Specifications

| | |
|---|---|
| **Course Title:** | Real Analysis(1) |
| **Course Code:** | 42041216 |
| **Program:** | B. Sc in Mathematics |
| **Department:** | Department of Mathematics |
| **College:** | Faculty of Science and Arts in Qilawah |
| **Institution:** | AlBaha University |

## Table of Contents

## A. Course Identification

| |
|---|
| **1. Credit : 3(4)** |
| **2. Course type**<br>**a.** University ☐ College ☐ Department ☑ Others ☐<br>**b.** Required ☑ Elective ☐ |
| **3. Level/year at which this course is offered:4 Second Year** |
| **4. Pre-requisites for this course** (if any)**: Differential &Integral(1) (42041103)** |
| **5. Co-requisites for this course** (if any)**:NA** |

**6. Mode of Instruction** (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | **Traditional classroom** | √ | 75 |
| 2 | **Blended** | √ | 10 |
| 3 | **E-learning** | √ | 15 |
| 4 | **Correspondence** | | |
| 5 | **Other** | | |

**7. Actual Learning Hours** (based on academic semester)

| No | Activity | Learning Hours |
|---|---|---|
| **Contact Hours** | | |
| 1 | **Lecture** | 30 |
| 2 | **Laboratory/Studio** | |
| 3 | **Tutorial** | 30 |
| 4 | **Others** (specify) | |
| | **Total** | 60 |
| **Other Learning Hours*** | | |
| 1 | **Study** | 90 |
| 2 | **Assignments** | 45 |
| 3 | **Library** | 45 |
| 4 | **Projects/Research Essays/Theses** | ----- |
| 5 | **Others**(specify) | |
| | **Total** | 180 |

***The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes

**1. Course Description**: Basic properties of the field of real numbers, completeness axiom, countable sets.Sequences and their convergence, monotone sequence, subsequences, Cauchy Sequences ,subsequences, Cauchy Sequences, Bolzano-Weierstrass theorem. Cauchy criterion. Basic topological properties of the real numbers. Limit of a function, continuous functions and properties of continuity, uniform continuity, compact sets. The derivative of a function, mean value theorem, L'Hospital rule, Taylor formula with remainder.

**2. Course Main Objective**: Verify the existence of the limit of a convergence sequences.

Verify the existence of the limit of a function.

Verify the continuity of a function at a point and on a set of points.

Verify the differentiability.

### 3. Course Learning Outcomes

| | CLOs | AlignedPLOs |
|---|---|---|
| 1 | **Knowledge:** | |
| 1.1 | Define basic properties and completeness axiom of the field of real numbers, countable sets, maxima and minima of subsets of the field of real numbers. | K1 |
| 1.2 | Sequences and subsequences, state when they are convergent. | K2 |
| 1.3 | Describe monotone sequence, subsequence, Cauchy sequence. State Bolzano-Weierstrass theorem. | K3 |
| 1... | | |
| 2 | **Skills :** | |
| 2.1 | Study Cauchy criteria for given sequences. | S1 |
| 2.2 | Solve problems concerning limits of a given functions as well as finding its expansion by means of Taylor formula. | S3 |
| 2.3 | Study the continuity and uniform continuity for a given function. | S2 |
| 2.4 | Finding derivatives for a given function. Prove the mean value theorem and solve problems concerning its applications. | S4 |
| 3 | **Competence:** | |
| 3.1 | To participate in the discussion. | C1 |
| 3.2 | Study, learn and work independently. | C2 |
| 3.3 | Work effectively in teams. | C3 |
| 3... | | |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | Basic properties of the field of real numbers, completeness axiom | 8 |
| 2 | Countable sets, Sequences and their convergence, subsequences | 12 |
| 3 | Monotone sequence, subsequences, Cauchy Sequences ,Bolzano-Weierstrass theorem. | 12 |
| 4 | Cauchy criterion. Basic topological properties of the real numbers. | 4 |
| 5 | Limit of a function, L'Hospital rule, Taylor formula with remainder | 12 |
| 6 | Continuous functions and properties of continuity, uniform Continuity, compact sets. The derivative of a function, mean value theorem, | 12 |
| **Total** | | 60 |

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | TeachingStrategies | AssessmentMethods |
|---|---|---|---|
| **1.0** | **Knowledge** | | |
| 1.1 | Define basic properties and completeness axiom of the field of real numbers, countable sets, maxima and minima of subsets of the field of real numbers. | Lectures<br>PowerPoint presentation<br>Debate and discussion.<br>Assignments (Co-operative & Individual assignments).<br>Cooperative Learning<br>Working in small groups<br>Individual & group research | Continuous evaluation through interaction, and presentation of research projects.<br>Evaluation of assignments.<br>Quiz1 & Quiz2.<br>Midterm exam.<br>Final written exams. |
| 1.2 | Sequences and subsequences, state when they are convergent. | Lectures<br>PowerPoint presentation<br>Debate and discussion.<br>Assignments (Co-operative & Individual assignments).<br>Cooperative Learning<br>Working in small groups<br>Individual & group research<br>. | Continuous evaluation through interaction, and presentation of summaries and reports during lectures.<br>Evaluation of assignments.<br>Quiz1 & Quiz2.<br>Midterm exam.<br>Final written exams. |
| 1.3 | Describe monotone sequence, subsequence, Cauchy sequence. State Bolzano-Weierstrass theorem. | Lectures<br>PowerPoint presentation<br>Debate and discussion.<br>Assignments (Co-operative & Individual assignments).<br>Cooperative Learning<br>Working in small groups<br>Individual & group research. | Continuous evaluation through interaction, and presentation of summaries and reports during lectures.<br>Evaluation of assignments.<br>Quiz1 & Quiz2.<br>Midterm exam.<br>Final written exams. |
| **2.0** | Skills | | |
| 2.1 | Study Cauchy criteria for given sequences. | • . Lectures<br>PowerPoint presentation<br>Debate and discussion.<br>Assignments (Co-operative & Individual assignments).<br>Cooperative Learning<br>Working in small groups<br>Individual & group research | Continuous evaluation through interaction, and presentation of summaries and reports during lectures.<br>Evaluation of assignments.<br>Quiz1 & Quiz2. |
| 2.2 | Solve problems concerning limits of a given functions as well as finding its expansion by means of Taylor formula. | Lectures<br>PowerPoint presentation<br>Debate and discussion.<br>Assignments (Co- | Continuous evaluation through interaction, and presentation of summaries and reports |

| Code | Course Learning Outcomes | TeachingStrategies | AssessmentMethods |
|---|---|---|---|
| | | operative & Individual assignments).<br>Cooperative Learning<br>Working in small groups<br>Individual & group research | during lectures.<br>Evaluation of assignments.<br>Quiz1 & Quiz2.<br>Midterm exam.<br>Final written exams |
| 2.3 | Study the continuity and uniform continuity for a given function. | Lectures<br>PowerPoint presentation<br>Debate and discussion.<br>Assignments (Co-operative & Individual assignments).<br>Cooperative Learning<br>Working in small groups<br>Individual & group research | Continuous evaluation through interaction, and presentation of summaries and reports during lectures.<br>Evaluation of assignments.<br>Quiz1 & Quiz2.<br>Midterm exam.<br>Final written exams |
| 2.4 | Finding derivatives for a given function. Prove the mean value theorem and solve problems concerning its applications. | | |
| **3.** | **Competence** | | |
| 3.1 | To participate in the discussion. | Team work- Assignments- student presentation- reporting- Scientific media<br>Co-operative & Individual assignments.<br>Cooperative Learning. | Evaluation of individual & group works.<br>Observation Card |
| 3.2 | Study, learn and work independently. | Working in small groups<br>Group research | Evaluation of individual & group works. |
| 3.3 | Work effectively in teams. | Team work<br>small groups and the distribution of roles.<br>PowerPoint presentation.<br>Writing reports | Oral discussion<br>Report evaluation |

## 2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---|---|---|
| **1** | Quiz 1 | 5 | 10 |
| **2** | Midterm Written Theoretical Exam | 9 | 20 |
| **3** | Quiz2 | 13 | 10 |
| **4** | Assignments, Activities & Attendance | During Semester | 10 |
| **5** | Final Practical Exam | - | - |
| **6** | Lab Reports | - | - |
| **7** | Final Written Theoretical Exam | 17 | 50 |
| **8** | | | |

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

# E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**

- The presence of faculty members to provide advice, academic advice and academic guidance to the student in need within the six hours a week available to all students.
- Arrange extra hours gifted students or Program for students who default in scholastic achievement

## F. Learning Resources and Facilities

### 1.Learning Resources

| | |
|---|---|
| **Required Textbooks** | - Course notes<br>- Chapters from different text books |
| **Essential References Materials** | 1-K. a. Ross, Elementary Analysis (The Theory of Calculus ) Springer vrlage, 1980.<br>2 - Method of Real Analysis. R. Goledberg, Willy, 1974.<br>3-Prenciple of Math. Analysis, W. Ruden . 3 edd. Magzo Hall, 1976 |
| **Electronic Materials** | Web Sites<br>*http://www.google.com* |
| **Other Learning Materials** | ---- |

### 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation**<br>(Classrooms, laboratories, demonstration rooms/labs, etc.) | Classrooms equipped with smart board and display screen for (40) students |
| **Technology Resources**<br>(AV, data show, Smart Board, software, etc.) | Provision of computers for students training to be used in research on scientific topics that serve the course. |
| **Other Resources**<br>(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | ------ |

## G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Extent of achievement of course learning outcomes | The teacher using an excel program that measure CLO's | Direct |
| Quality of learning resources | Students and Program Leaders | Direct |

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
**Evaluators** (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
**Assessment Methods**(Direct, Indirect)

## H. Specification Approval Data

| | |
|---|---|
| **Council / Committee** | |
| **Reference No.** | |
| **Date** | |

# Course Specifications

| | |
|---|---|
| **Course Title:** | Differential & Integral (3) |
| **Course Code:** | 42041220 |
| **Program:** | B. Sc in Mathematics |
| **Department:** | Department of Mathematics |
| **College:** | Faculty of Science and Arts in Qilawah |
| **Institution:** | AlBaha University |

## Table of Contents

## A. Course Identification

| | |
|---|---|
| **1. Credit hours: 3(4)** | |
| **2. Course type**<br>**a.** University ☐ College ☐ Department ☑ Others ☐<br>**b.** Required ☑ Elective ☐ | |
| **3. Level/year at which this course is offered:** | **Level: 4 / year:2** |
| **4. Pre-requisites for this course** (if any)**: Differential & Integral (2)( 42041223)** | |
| **5. Co-requisites for this course** (if any)**: Non** | |
| | |

**6. Mode of Instruction** (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | **Traditional classroom** | √ | **75%** |
| 2 | **Blended** | √ | **10%** |
| 3 | **E-learning** | √ | **15%** |
| 4 | **Correspondence** | | |
| 5 | **Other** | | |

**7. Actual Learning Hours** (based on academic semester)

| No | Activity | Learning Hours |
|---|---|---|
| **Contact Hours** | | |
| 1 | **Lecture** | 30 |
| 2 | **Laboratory/Studio** | |
| 3 | **Tutorial** | 30 |
| 4 | **Others** (specify) | |
| | **Total** | 60 |
| **Other Learning Hours*** | | |
| 1 | **Study** | 90 |
| 2 | **Assignments** | 45 |
| 3 | **Library** | 45 |
| 4 | **Projects/Research Essays/Theses** | |
| 5 | **Others** (specify) | |
| | **Total** | 180 |

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes

### 1. Course Description:

Advanced topics in Calculus, including vector functions, functions of two and three variables, limits and continuity, partial derivatives, directional derivatives, extrema of functions of two variables; double integrals in rectangular and polar coordinates, triple integrals in cylindrical and spherical coordinates, application of the line integral, including Green's Theorem, curl and divergence, surface integrals, the Divergence Theorem, and the Stokes' Theorem.

### 2. Course Main Objective

If you successfully complete this course, you will be able to:

**In Vectors Functions**

- Sketch vector-valued functions;
- Determine the relationship between these functions and the parametric representations of space curves;
- Compute the limit, derivative, and integral of a vector-valued function;
- Calculate the arc length of a curve and its curvature; identify the unit tangent, unit normal and binormal vectors;
- Calculate the tangential and normal components of a vector;
- Describe motion in space.

**In Partial Derivatives**

- Define functions of several variables and know the concepts of dependent variable, independent variables, domain and range;
- Calculate limits of functions in two variables or prove that a limit does not exist;
- Test the continuity of functions of several variables;
- Calculate partial derivatives and interpret them geometrically, calculate higher partial derivatives;
- Determine the equation of a tangent plane to a surface;
- Calculate the change in a function by linearization and by differentials;
- Determine total and partial derivatives using chain rules;
- Calculate directional derivatives and interpret the results
- Identify the gradient, interpret the gradient, and use it to find directional derivative;
- Apply intuitive knowledge of concepts of extrema for functions of several variables, and apply them to mathematical and applied problems.
- Understand method of Lagrange multipliers.

**In Multiple Integrals**

- Define double integral, evaluate a double integral by the definition and the midpoint rule and describe the simplest properties of them;
- Calculate iterated integrals by Fubini's Theorem;
- Calculate double integrals over general regions and use the geometric interpretation of double integral as a volume to calculate such volumes. Some applications of double integrals may include computing mass, electric charge, the center of mass and moment of inertia;
- Evaluate double integrals in polar coordinates to calculate polar areas, evaluate Cartesian double integrals of a particular form by transforming to polar double integrals;

- Define triple integrals, evaluate triple integrals, and know the simplest properties of them. Calculate volumes by triple integrals;
- Transform between Cartesian, cylindrical, and spherical coordinate systems; evaluate triple integrals in all three coordinate systems; make a change of variables using the Jacobian.

**In Vector Calculus**

- Describe vector fields in two and three dimensions graphically; determine if vector fields are conservative, directly and using theorems;
- Identify the meaning and set-up of line integrals and evaluate line integrals;
- Apply the connection between the concepts of conservative force field, independence of path, the existence of potentials, and the fundamental theorem for line integrals;
- Calculate the work done by a force as a line integral;
- Apply Green's theorem to evaluate line integrals as double integrals and conversely;
- Calculate and interpret the curl, gradient, and the divergence of a vector field;
- Evaluate a surface integral;
- Understand the concept of the flux of a vector field;
- State and use Stokes Theorem
- State and use the Divergence Theorem.

## 3. Course Learning Outcomes

| | CLOs | Aligned PLOs |
|---|---|---|
| 1 | **Knowledge:** | |
| 1.1 | **Define:** Vector-Valued functions, domain and range of multivariable or vector-valued functions, graphs of functions of two variables, and level surfaces of functions of three variables, line integrals, surface integrals, the connections between these new types of integrals and the single, double, and triple integrals. cylinders, quadric surfaces | |
| 1.2 | State the Fundamental Theorem of Calculus: Green's Theorem, Stokes' Theorem, and the Divergence Theorem | |
| 1.3 | Extend the idea of a definite integral to double and triple integrals of functions of two or three variables. These ideas are then used to compute volumes, masses. | |
| | | |
| **2** | **Skills :** | |
| 2.1 | Find equations of tangent planes/line and Normal planes/lines | |
| 2.2 | Studying functions of two or more variables from four points of view: verbally (by a description in words), numerically (by a table of values), algebraically (by an explicit formula), visually (by a graph or level curves) | |
| 2.3 | Find the limit and continuity of a function in two variables. | |
| 2.4 | Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals | |
| 2.5 | Interpret the geometrical and physical properties of partial derivatives. | |
| | | |
| **3** | **Competence:** | |
| 3.1 | Minimize/Maximize functions of two or more variables and applications of max/min | |
| 3.2 | Use Vector-Valued function in applications of motion in space and find the extrema and tangent planes. | |
| 3.3 | Evaluate multiple integrals by iteration using rectangular, polar, cylindrical and spherical coordinates | |

| CLOs | | Aligned PLOs |
|---|---|---|
| 3.4 | Apply the Fundamental Theorem of Line Integrals, Green's Theorem, The Divergence Theorem and Stokes' Theorem. | |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | Vector Functions | 12 |
| 2 | Partial Differentiation | 16 |
| 3 | Multiple Integration | 16 |
| 4 | Vector Analysis | 16 |
| 5 | | |
| ... | | |
| **Total** | | 60 |

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| **1.0** | **Knowledge** | | |
| 1.1 | **Demonstrate knowledge of vector operations such as addition, subtraction, Dot Product, Cross Product and vector applications, graphs of functions of two variables, and level surfaces of functions of three variables, Line integrals, surface integrals, cylinders, quadric surfaces** | • **Lectures**<br>• **Debate and discussion**<br>• **Assignments (Co-operative & Individual assignments).**<br>• **Working in small groups** | • **Continuous evaluation through interaction, and presentation of summaries and reports during lectures.**<br>• **Evaluation of assignments.**<br>• **Quiz1 & Quiz2.**<br>• **Midterm exam.**<br>• **Final written exams.** |
| 1.2 | **State the Fundamental Theorem of Calculus: Green's Theorem, Stokes' Theorem, and the Divergence Theorem, and Other related theorems** | • **Lectures**<br>• **PowerPoint presentation**<br>• **Debate and discussion**<br>• **Assignments (Co-operative & Individual assignments).**<br>• **Cooperative Learning**<br>• **Working in small groups Individual & group research** | • **Continuous evaluation through interaction, and presentation of summaries and reports during lectures.**<br>• **Evaluation of assignments.**<br>• **Quiz1 & Quiz2.**<br>• **Midterm exam.**<br>• **Final written exams.** |
| 1.3 | **Demonstrate knowledge of of Calculus of Vector Valued functions, Cylindrical and Spherical Coordinates** | • **Lectures**<br>• **PowerPoint presentation**<br>• **Debate and discussion**<br>• **Assignments (Co-operative & Individual assignments).**<br>• **Cooperative Learning**<br>• **Working in small groups Individual & group research** | • **Continuous evaluation through interaction, and presentation of summaries and reports during lectures.**<br>• **Evaluation of assignments.**<br>• **Quiz1 & Quiz2.**<br>• **Midterm exam.**<br>• **Final written exams.** |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| 2.0 | **Skills** | | |
| 2.1 | **- Determine: the domain of a multivariable function, the graph of an equation in three-dimensional space, limits and continuity of multivariable functions.**<br>**- Sketch level curves and surfaces of multivariable functions.**<br>**- Perform operations on vectors and vector-valued functions, and use them to solve problems in two- and three-dimensional space.** | • **Lectures**<br>• **PowerPoint presentation**<br>• **Debate and discussion**<br>• **Assignments (Co-operative & Individual assignments).**<br>• **Cooperative Learning**<br>• **Working in small groups Individual & group research** | • **Continuous evaluation through interaction, and presentation of summaries and reports during lectures.**<br>• **Evaluation of assignments.**<br>• **Quiz1 & Quiz2.**<br>• **Midterm exam.**<br>• **Final written exams.** |
| 2.2 | **- Perform operations with vectors and vector-valued functions**<br>**-Utilizing the concepts of scalars, unit vectors, dot product, cross product, orthogonal vectors, components, limits, differentiation, and integration** | • **Lectures**<br>• **PowerPoint presentation**<br>• **Debate and discussion**<br>• **Assignments (Co-operative & Individual assignments).**<br>• **Cooperative Learning**<br>• **Working in small groups Individual & group research** | • **Continuous evaluation through interaction, and presentation of summaries and reports during lectures.**<br>• **Evaluation of assignments.**<br>• **Quiz1 & Quiz2.**<br>• **Midterm exam.**<br>• **Final written exams.** |
| 2.3 | **Use vectors to solve problems of curvilinear motion involving the concepts of velocity, acceleration, arc length, curvature, tangential, and normal components** | • **Lectures**<br>• **PowerPoint presentation**<br>• **Debate and discussion**<br>• **Assignments (Co-operative & Individual assignments).**<br>• **Cooperative Learning**<br>• **Working in small groups Individual & group research** | • **Continuous evaluation through interaction, and presentation of summaries and reports during lectures.**<br>• **Evaluation of assignments.**<br>• **Quiz1 & Quiz2.**<br>• **Midterm exam.**<br>• **Final written exams.** |
| 2.4 | **- Compute partial derivatives in two and three independent variables.**<br>**- Interpret the geometrical and physical properties of partial derivatives.**<br>**- Minimize/Maximize functions of two or more variables and applications of max/min.** | • **Lectures**<br>• **PowerPoint presentation**<br>• **Debate and discussion**<br>• **Assignments (Co-operative & Individual assignments).**<br>• **Cooperative Learning**<br>• **Working in small groups Individual & group research** | • **Continuous evaluation through interaction, and presentation of summaries and reports during lectures.**<br>• **Evaluation of assignments.**<br>• **Quiz1 & Quiz2.**<br>• **Midterm exam.**<br>• **Final written exams.** |
| 2.5 | **Use partial derivatives, the gradient, and directional derivatives to solve application problems.** | • **Lectures**<br>• **PowerPoint presentation**<br>• **Debate and discussion**<br>• **Assignments (Co-** | • **Continuous evaluation through interaction, and presentation of summaries and reports during** |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| | | operative & Individual assignments).<br>• Cooperative Learning<br>• Working in small groups Individual & group research | lectures.<br>• Evaluation of assignments.<br>• Quiz1 & Quiz2.<br>• Midterm exam.<br>• Final written exams. |
| 3.0 | **Competence** | | |
| 3.1 | **Take responsibility for own learning and professional development** | **Team work- Assignments- student presentation- reporting- Scientific media Co-operative & Individual assignments. Cooperative Learning.** | **Evaluation of individual & group works.**<br>**Observation Card** |
| 3.2 | **Work effectively in groups and exercise leadership when appropriate** | **Working in small groups Group research** | **Evaluation of individual & group works.** |
| 3.3 | **- Evaluate multiple integrals by iteration using rectangular, polar, cylindrical and spherical Coordinates.<br>- Compute applications of Double and Triple Integrals.<br>-Evaluate multiple integrals, and apply them to solve problems involving areas and volumes over two- and three-dimensional regions.** | • Team work<br>• Small groups and the distribution of roles.<br>• PowerPoint presentation.<br>• Writing reports | **Oral discussion<br>Report evaluation** |
| 3.4 | **- Evaluate multiple integrals by iteration using rectangular, polar, cylindrical and spherical coordinates.<br>- Compute applications of Double and Triple Integrals.<br>-Evaluate multiple integrals, and apply them to solve problems involving areas and volumes over two- and three-dimensional regions.** | • Small groups and the distribution of roles.<br>• PowerPoint presentation.<br>• Writing reports | **Oral discussion<br>Report evaluation** |

## 2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---|---|---|
| **1** | Quiz 1 | 5 | 10 |
| **2** | Midterm Written Theoretical Exam | 9 | 20 |
| **3** | Quiz 2 | 13 | 10 |
| **4** | Assignments, Activities & Attendance | During Semester | 10 |
| **5** | Final Practical Exam | | |

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---|---|---|
| 6 | Lab Reports | ------ | |
| 7 | Final Written Theoretical Exam | 17 | 50 |

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**

- The presence of faculty members to provide advice, academic advice and academic guidance to the student in need within the six hours a week available to all students.
- Arrange extra hours gifted students or Program for students who default in scholastic achievement

## F. Learning Resources and Facilities

### 1. Learning Resources

| | |
|---|---|
| **Required Textbooks** | James Stewart (2007) Calculus III. Brooks Cole. |
| **Essential References Materials** | 1. Marsden, Jerrold E. and Weinstein, Alan J. (1985), Calculus III. Springer-Verlag, New York. ISBN.<br>2. Postal, T. T. Mathematical analysis, Addison, Wesley, Reading, 1974.<br>3. Harcout Javavach. Rebertellis, Denny Gulicky 1982, Calculus with analytics geometry<br>4. Prenciple of Math. Analysis, W. Ruden. 3 edd. Magzo Hall, 1976 |
| **Electronic Materials** | http://www.google.com. |
| **Other Learning Materials** | CD-ROM containing the scientific subjects in the course |

### 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation** (Classrooms, laboratories, demonstration rooms/labs, etc.) | Classrooms equipped with smart board and display screen for (40) students |
| **Technology Resources** (AV, data show, Smart Board, software, etc.) | Provision of computers for students training to be used in research on scientific topics that serve the course |
| **Other Resources** (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | |

## G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Extent of achievement of course learning outcomes | The teacher using an excel program that measure CLO's | Direct |
| Quality of learning resources | Students and Program Leaders | Direct |
| | | |
| | | |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

| | |
|---|---|
| **Council / Committee** | 1- Prof. Dr./ Sayed Saber Ali Ahmed |
| **Reference No.** | |
| **Date** | |

المركز الوطني للتقويم والاعتماد الأكاديمي
National Center for Academic Accreditation and Evaluation

# T6. COURSE SPECIFICATIONS (CS)

**According to National Center for Academic Accreditation and Evaluation**

**Mathematics Department**

**Course Name:** Computer Skills

**Course Code:** 42051202

# Course Specification

| | |
|---|---|
| **Institution :** | AlBaha University |
| **College/Department : Faculty of Science and Arts in Qilawah / Mathematics Department** | |

**A Course Identification and General Information**

| |
|---|
| **1. Course title and code Computer Skills** (42051202 ) |
| **2. Credit hours : 2** |
| **3. Program(s) in which the course is offered** : Mathematics Department<br>(If general elective available in many programs indicate this rather than list programs) |
| **4. Name of faculty member responsible for the course :**<br>Staff members of Mathematics department |
| **5. Level/year at which this course is offered** : Level 2 / First Year |
| **6. Pre-requisites for this course (if any) –** |
| **7. Co-requisites for this course (if any) N/A –** |
| **8. Location if not on main campus :** Science faculties at the University of Al-Baha |

**9.** Mode of Instruction (mark all that apply):

| | | | |
|---|---|---|---|
| a. traditional classroom | √ | What percentage? | **70** |
| b. blended (traditional and online) | √ | What percentage? | **5** |
| c. e-learning | √ | What percentage? | **5** |
| d. correspondence | | What percentage? | |
| f. other | √ | What percentage? (practical) | **20** |

**B Objectives**

Summary of the main learning outcomes for students enrolled in the course.

- Recognize the different P.C hardware components.
- Understand what software is.
- **Distinguish between the various kinds of software and how to correctly use them.**
- **Understand what an Operating System is and what it does.**
- **Have a good working knowledge of the Microsoft Windows Operating System.**
- Learn how to manage and find computer resources.
- **Have a working knowledge of Microsoft office's most common functions: Microsoft Word, Excel, and Power Point.**
- Recognize the main elements of web sites.
- Learn how to "Surf the Internet".

2. Briefly describe any plans for developing and improving the course that are being implemented.

- focus on practical side in course And planning to hold examinations electronically in the future

**C. Course Description**

This course covers the basic concepts of computing literacy, and introduces operating systems and various important software packages for word processing, spreadsheets, and presentations. It also touches on some of the Internet concepts and services including the Web and the electronic mail.

| 1. TOPICS to be COVERED | No. of Weeks | Contact Hours |
|---|---|---|
| **Introduction to Computer Hardware** | **2** | **6** |
| **Introduction to Computer Soft ware** | **2** | **6** |
| **Introduction to Operating system and how its work** | **1** | **3** |
| **Ms. Windows** | **2** | **6** |
| **Ms. Word** | **2** | **6** |
| **Ms. Excel** | **2** | **6** |
| **Ms. Power Point** | **2** | **6** |
| **Internet and emailing** | **2** | **6** |

**2 Course components (total contact hours per semester):**

| **Lecture**: | **Tutorial**: | **Practical/Fieldwork/Internship: N/A** | **Other**: |
|---|---|---|---|
| 15 contact hours | - | 30 hours | - |

**3** Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week)

**4. Development of Learning Outcomes in Domains of Learning**

For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned

**a. Knowledge**

(i) **Description of the knowledge to be acquired**

- the students learns the main physical components of a computer
- recognize the concept of software
- recognize the concept of the operating system and its importance and how it works
- the students learns common computer words

**(ii) Teaching strategies to be used to develop that knowledge**

- **Explain topics related to course using smart board and graphics**
- Using data show
- using brainstorming, dialog and discussion

**(iii) Methods of assessment of knowledge acquired**

- Quiz
- Number of questions in midterm exam ( multiple choice questions)

**b. Cognitive Skills**

**(i) Cognitive skills to be developed**

• The ability to deal with a computer
• The ability to deal with-the-shelf software
• The ability to use the software in completing everyday tasks such as printing and the use of spreadsheet

**(ii) Teaching strategies to be used to develop these cognitive skills**

- **Use computers lab to learn the practical side**
- discussion and dialogue

**(iii) Methods of assessment of students cognitive skills**

**• Practical tests at 60% of the course mark**
**• Homework**

## c. Interpersonal Skills and Responsibility

**(i) Description of the interpersonal skills and capacity to carry responsibility to be developed**

**• Self-reliance and responsibility**
**• Teamwork**

**(ii) Teaching strategies to be used to develop these skills and abilities**

- Group work

**(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility**

- Presentations .

## d. Communication, Information Technology and Numerical Skills

**(i) Description of the skills to be developed in this domain.**

- Development of programs for scientific topics.
- The use of software.
- Making the student as good as we can

(ii) Teaching strategies to be used to develop these skills

- **Using computer.**
- **Lecture.**
- **Share the students in understanding the skill and practice it.**

**(iii) Methods of assessment of students numerical and communication skills**

- **Tests**
- **observation and continuous evaluation.**
- **questionnaires students to know the opinion of the student**

## e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required
N/A

(ii) Teaching strategies to be used to develop these skills
N/A.

(iii) Methods of assessment of students psychomotor skills
N/A

5. Schedule of Assessment Tasks for Students During the Semester

| Assessment | Assessment task (eg. essay, test, group project, examination etc.) | Week due | Proportion of Final Assessment |
|---|---|---|---|
| 1 | **Quiz** | **3** | **5%** |
| 2 | **Midterm** | **6** | **20%** |
| 3 | **Quiz** | **8** | **5%** |
| 4 | **Midterm** | **12** | **20%** |
| 5 | **project** | **14** | **10%** |
| 6 | **Final exam** | **17** | **40** |

## D. Student Support

1. **Arrangements for availability of faculty for individual student consultations and academic advice.** (include amount of time faculty are available each week)

- 4 office hours per week for all lecturers
- Identify members of academic advising to support students

## E Learning Resources

**1. Required Text(s)**

Computing Basics series .part1- 1v, Cheltenham courseware, 1st Edition)

**2. Essential References**

• Textbook
**• Notes written by teacher**
**• additional papers that are distributed during the semester**

**3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)**

- Textbook for ICDL

**4-.Electronic Materials, Web Sites etc**

http://www.tutorialspoint.com/word_2010/index.htm
http://www.gcflearnfree.org/word2010
http://office.microsoft.com/en-us/training-FX101782702.aspx

**5- Other learning material such as computer-based programs/CD, professional standards/regulations**

- Microsoft office

## F. Facilities Required

**Indicate requirements for the course including size of classrooms and laboratories** (ie number of seats in classrooms and laboratories, extent of computer access etc.)

**1.Accommodation (Lecture rooms, laboratories, etc.)**

- Class room

**2. Computing resources**

- **Computer labs**

**3.Other resources**

- Smart boards
- Data show

## G Course Evaluation and Improvement Processes

**1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching**

- **Questioners for evaluating course .**

**2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department**

- **Monitoring student's feedback**

**3 Processes for Improvement of Teaching**

- Meetings to discuss developing course
- Workshops

**4. Processes for Verifying Standards of Student Achievement** (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

- Write and revise course questions by members
- **Double check course questions and grades by examiners and co- examiners**

Name of Course Instructor: _____

Signature: _____ Date Specification Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

# Course Specifications

| | |
|---|---|
| **Course Title:** | Introduction to Mathematical Statistics |
| **Course Code:** | 42041218 |
| **Program:** | B. Sc in Mathematics |
| **Department:** | Department of Mathematics |
| **College:** | Faculty of Science and Arts in Qilawah |
| **Institution:** | AlBaha University |

## Table of Contents

## A. Course Identification

| | |
|---|---|
| **1. Credit hours:** | 3 hours (lecture) |
| **2. Course type** | |
| **a.** | University ☐ College ☐ Department √ Others ☐ |
| **b.** | Required √ Elective ☐ |
| **3. Level/year at which this course is offered:** | **Level: 4/ year: 2** |
| **4. Pre-requisites for this course** (if any)**:** | Principle of Statistic and probability (42041217) |
| **5. Co-requisites for this course** (if any)**:** | Non |

**6. Mode of Instruction** (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | **Traditional classroom** | √ | 80% |
| 2 | **Blended** | √ | 10% |
| 3 | **E-learning** | √ | 10% |
| 4 | **Correspondence** | | |
| 5 | **Other** | | ---------- |

**7. Actual Learning Hours** (based on academic semester)

| No | Activity | Learning Hours |
|---|---|---|
| **Contact Hours** | | |
| 1 | **Lecture** | 60 |
| 2 | **Laboratory/Studio** | |
| 3 | **Tutorial** | |
| 4 | **Others** (specify) | |
| | **Total** | 60 |
| **Other Learning Hours*** | | |
| 1 | **Study** | 45 |
| 2 | **Assignments** | 15 |
| 3 | **Library** | |
| 4 | **Projects/Research Essays/Theses** | |
| 5 | **Others**(specify) | |
| | **Total** | 60 |

***The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes

### 1. Course Description

This course applies Introduction to Mathematical Statistics The course covers some topics such as basic concepts of the Probabilities theory. Fundamental probabilities Concepts conditional probability, independent events and disjoints events, probability distributions by using random variable, probability density function and mathematical expectation, Some Discrete Probability Distributions ,Some Continuous Probability Distributions and Functions of Random Variables

### 2. Course Main Objective

This course is aimed at applied the mathematical foundations to explain the statistical and probability concepts.

### 3. Course Learning Outcomes

| | CLOs | Aligned PLOs |
|---|---|---|
| 1 | **Knowledge:**<br>**Student should be able to** | |
| 1.1 | define the Discrete Probability Distributions<br>Classical definitions of probability, fundamental probability concepts, distribution theory random variables and moments. | k1 |
| 1.2 | We Know that the difference between the Discrete Probability Distributions& Continuous Probability Distributions. | K2 |
| 1.3 | How to use the theorems to find statistical measures (expected value, variance, moment generating function, correlation and covariance) mathematically. | K3 |
| **2** | **Skills:**<br>**Student should be able to** | |
| 2.1 | Apply mathematical rules to find expected values, variances, moments generating functions of the random variable. | S3 |
| 2.2 | Evaluate mean vector, covariance matrix, correlation of the random variables. | S1 |
| 2.3 | Find the relationship between PDF and CDF theoretically. the distributions of random variables | S2 |
| | | |
| **3** | **Competence**<br>**Student should be able to** | |
| 3.1 | take responsibility for own learning and professional development | C2 |
| 3.2 | work effectively in groups and exercise leadership when appropriate. | C3 |
| 3.3 | present information clearly in both written and oral form. | C1 |
| 3.4 | communicates effectively in oral and written form in educational situations related to the subjects of the course. | C1 |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | **Probability theory**.<br>Random event, Algebraic operations and programs with events.<br>Classical definition of probability.<br>Fundamental probability concepts.<br>Probability of the unification of random events.<br>Probability of the opposite event.<br>Full probability formula.<br>Conditional probability.<br>Total Probability Theory.<br>Bayes Theorem. | 8 |
| 2 | **Random variable**<br>Concept of a Random Variable<br>Discrete Probability Distributions<br>Continuous Probability Distributions<br>Joint Probability Distributions. | 12 |
| 3 | **Mathematical Expectation**<br>Mean of a Random Variables<br>Variance and Covariance of Random Variables.<br>Means and Variances of Linear Combinations of Random Variables<br>Chebyshev's Theorem. | 12 |
| 4 | **Some Discrete Probability Distributions**<br>Binomial and Multinomial Distributions<br>Hypergeometric Distribution<br>Negative Binomial and Geometric Distributions<br>Poisson Distribution and the Poisson Process | 12 |
| 5 | **Some Continuous Probability Distributions**.<br>Continuous Uniform Distribution<br>Normal Distribution<br>Applications of the Normal Distribution | 8 |
| 6 | **Functions of Random Variables**<br>Introduction<br>Transformations of Variables<br>Moments and Moment-Generating Functions | 8 |
| **Total** | | 60 |

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| **1.0** | **Knowledge** | | |
| 1.1 | define the Discrete Probability Distributions | Lectures.<br>PowerPoint presentation.<br>Debate and discussion.<br>Cooperative Learning. | Quiz1 and Quiz 2.<br>Assignments.<br>Midterm exam.<br>Final exam. |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| | | Working in small groups.<br>Individual and group research. | |
| 1.2 | We Know that the difference between the Discrete Probability Distributions& Continuous Probability Distributions. | Lectures.<br>PowerPoint presentation.<br>Debate and discussion.<br>Cooperative Learning.<br>Working in small groups.<br>Individual and group research. | Quiz1 and Quiz 2.<br>Assignments.<br>Midterm exam.<br>Final exam. |
| 1.3 | How to use the theorems to find statistical measures (expected value, variance, and moment generating function, correlation and covariance) mathematically. | Lectures.<br>PowerPoint presentation.<br>Debate and discussion.<br>Cooperative Learning.<br>Working in small groups.<br>Individual and group research. | Quiz1 and Quiz 2.<br>Assignments.<br>Midterm exam.<br>Final exam. |
| **2.0** | **Skills** | | |
| 2.1 | Apply mathematical rules to find expected values, variances, moments generating functions of the random variable. | Lectures.<br>PowerPoint presentation.<br>Debate and discussion.<br>Cooperative Learning.<br>Working in small groups.<br>Individual and group research. | Quiz1 and Quiz 2.<br>Assignments.<br>Midterm exam.<br>Final exam. |
| 2.2 | Evaluate mean vector, covariance matrix, correlation of the random variables. | Lectures.<br>PowerPoint presentation.<br>Debate and discussion.<br>Cooperative Learning.<br>Working in small groups.<br>Individual and group research. | Quiz1 and Quiz 2.<br>Assignments.<br>Midterm exam.<br>Final exam. |
| 2.3 | Find the relationship between PDF and CDF theoretically. the distributions of random variables | Lectures.<br>PowerPoint presentation.<br>Debate and discussion.<br>Cooperative Learning.<br>Working in small groups.<br>Individual and group research. | Quiz1 and Quiz 2.<br>Assignments.<br>Midterm exam.<br>Final exam. |
| **3.0** | **Competence** | | |
| 3.1 | Take responsibility for own learning and professional development. | Teamwork.<br>Students presentation.<br>Reporting.<br>Scientific media. | Evaluation of individual and group works.<br>Observation card. |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| | | Cooperative and individual assignments.<br>Cooperative learning. | |
| 3.2 | Work effectively in groups and exercise leadership when appropriate. | Working in small groups.<br>Group research. | Evaluation of group works. |
| 3.3 | Present information clearly in both written and oral form. | Teamwork.<br>Small groups and the distribution of roles.<br>PowerPoint presentation.<br>Writing reports. | Oral discussion<br>Report evaluation |
| 3.4 | Communicates effectively in oral and written form in educational situations related to the subjects of the course. | Small groups and the distribution of roles.<br>PowerPoint presentation.<br>Writing reports. | Oral discussion.<br>Report evaluation. |

**2. Assessment Tasks for Students**

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---|---|---|
| **1** | Quiz 1 | 5 | 10 |
| **2** | Midterm Written Theoretical Exam | 9 | 20 |
| **3** | Quiz2 | 13 | 10 |
| **4** | Assignments, Activities and Attendance | During Semester | 10 |
| **5** | Final Practical Exam | - | - |
| **6** | Lab Reports | - | - |
| **7** | Final Written Theoretical Exam | 16 | 50 |

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:**

- The presence of faculty members to provide advice, academic advice and academic guidance to the student in need within the six hours a week available to all students.
- Arrange extra hours gifted students or Program for students who default in scholastic achievement

## F. Learning Resources and Facilities

**1.Learning Resources**

| | |
|---|---|
| **Required Textbooks** | Ronald E. Walpole and Raymond H. Myers (2007) Probability & Statistics for Engineers & Scientists 9th ed |
| **Essential References Materials** | Rice, J. A. (2006). *Mathematical statistics and data analysis*. Cengage Learning. |
| **Electronic Materials** | • http://www.maths.adelaide.edu.au/patty.solomon/MSIII2012/MSIII.pdf<br>• https://s3.amazonaws.com/arena-attachments/532676/c7837c7162f52f9f42c2f3c5cab303e1.pdf |

| | |
|---|---|
| | • http://fstroj.uniza.sk/kam/orsansky/pdf/eng/basicsofstatisticalmethods.pdf |
| **Other Learning Materials** | ---------- |

### 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation** (Classrooms, laboratories, demonstration rooms/labs, etc.) | Classrooms equipped with smart board and display screen for (40) students |
| **Technology Resources** (AV, data show, Smart Board, software, etc.) | Provision of computers for students training to be used in research on scientific topics that serve the course. |
| **Other Resources** (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | ------- |

## G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Extent of achievement of course learning outcomes | The teacher. | Using an excel program that measure CLO's. |
| Quality of learning resources | Students and Program Leaders. | Direct. |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

| | |
|---|---|
| **Council / Committee** | 1- Dr. Huda Mohammed Alomari<br>2- Dr/ Fath Elrhamn Elsmih Guma<br>3- Dr/ Alshaikh A.A.shokeralla |
| **Reference No.** | |
| **Date** | |

# Course Specifications

| | |
|---|---|
| **Course Title:** | Linear Algebra |
| **Course Code:** | 42041224 |
| **Program:** | B. Sc in Mathematics |
| **Department:** | Department of Mathematics |
| **College:** | Faculty of Science and Arts in Qilawah |
| **Institution:** | AlBaha University |

## Table of Contents

## A. Course Identification

| |
|---|
| **1. Credit hours:3(4)** |
| **2. Course type**<br>**a.** University ☐ College ☐ Department ☑ Others ☐<br>**b.** Required ☑ Elective ☐ |
| **3. Level/year at which this course is offered:** 4th Level , 2nd year |
| **4. Pre-requisites for this course** (if any)**:** N/A |
| **5. Co-requisites for this course** (if any)**:** |

**6. Mode of Instruction** (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | **Traditional classroom** | √ | 80% |
| 2 | **Blended** | √ | 20% |
| 3 | **E-learning** | | |
| 4 | **Correspondence** | | |
| 5 | **Other** | | |

**7. Actual Learning Hours** (based on academic semester)

| No | Activity | Learning Hours |
|---|---|---|
| **Contact Hours** | | |
| 1 | **Lecture** | 30 |
| 2 | **Laboratory/Studio** | |
| 3 | **Tutorial** | 30 |
| 4 | **Others** (specify) | |
| | **Total** | 60 |
| **Other Learning Hours*** | | |
| 1 | **Study** | 45 |
| 2 | **Assignments** | 15 |
| 3 | **Library** | 15 |
| 4 | **Projects/Research Essays/Theses** | -------- |
| 5 | **Others** (specify) | |
| | **Total** | 75 |

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes

**1. Course Description**

This course deals with the basic concepts of Linear Algebra which are crucial for understanding the theory behind Machine Learning. They give you better intuition for how algorithms really work under the hood, which enables you to make better decisions. So, if you really want to be a professional in this field, you cannot escape mastering some of its concepts. This course will give you an introduction to the most important concepts of Linear Algebra that are used for example in Numerical Analysis and in Machine Learning..

## 2. Course Main Objective

After studying this course:

- Students must master the basic concepts of linear algebra such as the calculus of the rank, the determinant and the inverse of a matrix as well as the dimension of vector spaces or vector subspaces.
- Students should be able to solve a system of linear equations by various methods.

Students should be able to understand the notion of linear transformations and its properties.

## 3. Course Learning Outcomes

| | CLOs | Aligned PLOs |
|---|---|---|
| 1 | **Knowledge:** | |
| 1.1 | Students should be able to **define** Linear Equations in n Variables - Homogeneous Systems - Operations with Matrices - The Transpose of a Matrix- Elementary Matrices - Vectors in $R^n$ - Vector Spaces - Subspaces of Vector Spaces - Linear Transformations. | 1.1 |
| 1.2 | Students should be able to **describe:** Elementary Row Operations - Representing the system of linear equations with matrices - Basis and Dimension - | 1.2 |
| 1.3 | Students should be able to **discuss:** Properties of Matrix Operations - Properties of Determinants - Spanning Sets and Linear Independence - Systems of Equations with the inverse of matrices. | 1.3 |
| 1... | | |
| **2** | **Skills :** | |
| 2.1 | Students should be able to **apply:** Back-Substitution and Row-Echelon Form - Evaluation of a Determinant Using Elementary Operations - 3Rank of a Matrix and Systems of Linear Equations - | 2.1 |
| 2.2 | Students should be able to **solve:** Solving a System of Linear Equations - The Inverse of a Matrix( by AX = I and by Gauss-Jordan Elimination ) - | 2.2 |
| 2.3 | Students should be able to **compute:** Systems of Linear Equations - The Determinant of a Matrix - Coordinates and Change of Basis - The Kernel and Range of a Linear Transformation | 2.3 |
| 2... | | |
| **3** | **Competence:** | |
| 3.1 | Students should be able to **analyze:** Gaussian Elimination and Gauss- | 3.1` |

| CLOs | | Aligned PLOs |
|---|---|---|
| | Jordan Elimination .- The LU-Factorization - Length and Dot Product in $R^n$ - | |
| 3.2 | Students should be able to **explain :** - Inner Product Spaces - Matrices for Linear Transformations - Transition Matrices and Similarity | 3.2 |
| | | |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | **Systems of Linear Equations**:<br><br>Linear Equations in n Variables - Systems of Linear Equations - Elementary Row Operations - Solving a System of Linear Equations - Back-Substitution and Row-Echelon Form - Gaussian Elimination and Gauss-Jordan Elimination - Homogeneous Systems. | 16 |
| 2 | **Matrices**<br><br>Operations with Matrices - Properties of Matrix Operations - Representing the system of linear equations with matrices - The Transpose of a Matrix- The Inverse of a Matrix( by AX = I and by Gauss-Jordan Elimination ) - Systems of Equations with the inverse of matrices - Elementary Matrices - The LU-Factorization - The Determinant of a Matrix - Evaluation of a Determinant Using Elementary Operations - Properties of Determinants | 16 |
| 3 | **Vector Spaces:**<br><br>Vectors in $R^n$ - Vector Spaces - Subspaces of Vector Spaces - Spanning Sets and Linear Independence - Basis and Dimension - Rank of a Matrix and Systems of Linear Equations | 16 |
| 4 | **Linear Transformations:**<br><br>Introduction to Linear Transformations - The Kernel and Range of a Linear Transformation- Isomorphism of linear transformations. | 12 |

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| **1.0** | **Knowledge** | | |
| 1.1 | **Define :** Linear Equations in n Variables - Homogeneous Systems - Operations with Matrices - The Transpose of a Matrix- Elementary Matrices - Vectors in $R^n$ - Vector Spaces - Subspaces of Vector Spaces - Linear Transformations. | - lectures,<br>- class recitation/ tutorial,<br>- group assignments<br>- Independent readings<br>- Homework<br>- assignments project | • Continuous evaluation through interaction, and presentation of summaries and reports during lectures.<br>• Evaluation of assignments.<br>• Quiz1 & Quiz2.<br>• Midterm exam.<br>• Final written exams. |
| 1.2 | **Describe:** Elementary Row Operations - Representing the system of linear equations with matrices - Basis and Dimension - | | |
| 1.3 | **Discuss:** Properties of Matrix Operations - Properties of Determinants - Spanning Sets and Linear Independence - Systems of Equations with the inverse of matrices - | | |
| **2.0** | **Skills** | | |
| 2.1 | **Apply :** Back-Substitution and Row-Echelon Form - Evaluation of a Determinant Using Elementary Operations - 3Rank of a Matrix and Systems of Linear Equations - | - lectures,<br>- class recitation/ tutorial,<br>- group assignments<br>- Independent readings<br>- Homework<br>- assignments project | • Continuous evaluation through interaction, and presentation of summaries and reports during lectures.<br>• Evaluation of assignments.<br>• Quiz1 & Quiz2.<br>• Midterm exam.<br>Final written exams |
| 2.2 | **Solve :** Solving a System of Linear Equations - The Inverse of a Matrix( by AX = I and by Gauss-Jordan Elimination ) - | | |
| … | **Compute :** Systems of Linear Equations - The Determinant of a Matrix - Coordinates and Change of Basis - The Kernel and Range of a Linear Transformation. | | |
| **3.0** | **Competence** | | |
| 3.1 | **Analyze:** Gaussian Elimination and Gauss-Jordan Elimination .- The LU-Factorization - Length and Dot Product in $R^n$ - | - lectures,<br>- class recitation/ tutorial, | • Continuous evaluation through interaction, and presentation of |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| 3.2 | **Explain :** - Inner Product Spaces - Matrices for Linear Transformations - Transition Matrices and Similarity | - group assignments<br>- Independent readings<br>- Homework<br>- assignments project | summaries and reports during lectures.<br>• Evaluation of assignments.<br>• Quiz1 & Quiz2.<br>• Midterm exam.<br>Final written exams |
| … | | | |

**2. Assessment Tasks for Students**

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---|---|---|
| **1** | Quiz 1 | 5 | 10 |
| **2** | Midterm Written Theoretical Exam | 9 | 20 |
| **3** | Quiz2 | 13 | 10 |
| **4** | Assignments, Activities & Attendance | During Semester | 10 |
| **5** | Final Practical Exam | - | - |
| **6** | Lab Reports | - | - |
| **7** | Final Written Theoretical Exam | 17 | 50 |
| **8** | Total | | 100 |

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**

- Follow-up by the head of the department.
- Define 8 office hours per week for each member of the faculty who resides in his office.
- Define 2 hours weekly as Academic guidance for each faculty member for guiding a group of students academically.
- Give guidance so encouraging in assessing the performance of a teacher.
- Creating the means to make the teacher benefit of his time during his stay in office. Non-scientific services to assist the teacher to attend office hours**.**

## F. Learning Resources and Facilities

**1.Learning Resources**

| | |
|---|---|
| **Required Textbooks** | - Course notes<br>- Chapters from different text books |
| **Essential References Materials** | **[1] – R. E. Larson and B.E. Edwards, Elementary Linear Algebra, 5th Edition, D.H. Heath and Company, (2004).** |
| **Electronic Materials** | **[1] – M. Thamban Nair - Arindama Singh, Linear Algebra (2018)**<br>**[2] – Belkacem Said-Houari , Linear Algebra (2017)**<br>**[3] - David C. Lay, Linear Algebra and its Applications, Addison Wesley** |

| | |
|---|---|
| | **(2003).**<br>**[4] - H. Anton, Elementary Linear Algebra, John Wiley (2001).**<br>**[5] - S. Lipschutz, Theory and problems of Linear Algebra, Schaum's Outline Series**<br><br>**(2000).** |
| **Other Learning Materials** | - CD-ROM containing the scientific subjects in the course |

### 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation**<br>(Classrooms, laboratories, demonstration rooms/labs, etc.) | Classrooms equipped with smart board and display screen for (40) students |
| **Technology Resources**<br>(AV, data show, Smart Board, software, etc.) | Provision of computers for students training to be used in research on scientific topics that serve the course. |
| **Other Resources**<br>(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | ------- |

## G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Extent of achievement of course learning outcomes | The teacher using an excel program that measure CLO's | Direct |
| Quality of learning resources | Students and Program Leaders | Direct |
| Effectiveness of teaching and assessment | Students | Direct |
| | | |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

| | |
|---|---|
| **Council / Committee** | |
| **Reference No.** | |
| **Date** | |