

**Ministry of Higher Education and Scientific  
Research  
Scientific Supervision and Evaluation Authority  
Quality Assurance and Academic Accreditation  
Department  
Accreditation Department**



# **Academic Program and Course Description Guide**

**Department of Statistics and Informatics  
Technology  
2025**

## Academic Program Description Form

University Name: Northern Technical University Iraq

Faculty/Institute: Administrative Technical College/ Mosul

Scientific Department: Statistics and Informatics Techniques

Academic or Professional Program Name: Statistics and Informatics Techniques

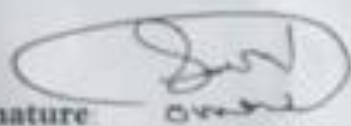
Final Certificate Name: Bs.c in Statistics

Academic System: Conc

Description Preparation Date: 22/6/2025

File Completion Date: 29/6/2025

Signature:



Head of Department Name:

Date: 22/6/2025

Signature:



Scientific Associate Name:

Date:

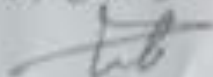
The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date: 22/6/2025

Signature:



Approval of the Dean

## 1.Program Vision

Preparing distinguished graduates in analysis and decision-making by integrating statistics and information technology to serve the information society.

## Program Mission .2

Providing students with applied skills in statistics and information technology, qualifying them for the job market and supporting decision-making based on scientific databases.

## 3.Program objectives

### **1.Academic Excellence:**

- Prepare graduates who are technically proficient in statistics and informatics, capable of utilizing artificial intelligence tools and advanced statistical modeling techniques.
- Continuously update curricula to align with technological advancements in data science, applied statistics, and multi-dimensional data analysis.
- Align academic content with labor market demands and international professional standards, while integrating real-world applications in statistical analysis and data-driven decision-making.
- Develop a comprehensive digital learning environment that enhances the use of statistical software, forecasting tools, and intelligent analytics to produce graduates capable of supporting evidence-based policymaking.

### **2. Scientific Research and Innovation:**

- Foster a culture of innovation and continuous learning among students and faculty to address analytical challenges in data-driven environments.
- Support the production of applied research in digital statistics, artificial intelligence, governance, and various data analysis domains.
- Organize conferences and specialized scientific workshops to promote knowledge exchange and academic development.

### **3. Community Service:**

- Contribute to sustainable development by applying statistical analysis in shaping public policies and community initiatives.

- Promote public awareness about the importance of statistics in everyday life through training programs, workshops, and outreach activities.

#### **4. Professional Development and Leadership:**

- Develop students' leadership and analytical skills to enable them to work effectively in research institutions, governmental bodies, and the private sector.
- Provide advanced training opportunities, both on-site and online, to enhance graduates' career readiness in data analysis and statistical modeling.

#### **5. Financial and Material Sustainability:**

- Adopt efficient resource management policies and support self-funding initiatives based on analytical and consultancy projects.
- Develop investment plans that promote the department's autonomy and long-term sustainability.

#### **6. Transparency and Governance:**

- Uphold principles of transparency and good governance in academic and administrative decision-making.
- Implement monitoring and self-evaluation mechanisms to ensure performance quality and accountability.

#### **7. International Cooperation and Labor Market Integration:**

- Build strategic partnerships with labor market institutions, technology and analytics companies to support training, employment, and knowledge exchange.
- Expand international collaboration through academic agreements and student/faculty exchange programs with regional and global universities.

#### **4. Program accreditation**

N0 Found

#### **.5Other external influences**

N0 Found

#### **6..Program description**

| Credit Hours  |   | Course Name                           | Course Code | Year/Level              |
|---------------|---|---------------------------------------|-------------|-------------------------|
| Course system | 4 | English 3                             | NTU300      | Third level (2025-2026) |
| Course system | 4 | Principles of Mathematical Statistics | SIT310      | Third level (2025-2026) |
| Course system | 4 | Operations Research                   | SIT311      | Third level (2025-2026) |
| Course system | 4 | Linear Regression Analysis            | SIT312      | Third level (2025-2026) |
| Course system | 4 | Principles of Biostatistics           | SIT314      | Third level (2025-2026) |
| Course system | 4 | Reliability                           | SIT316      | Third level (2025-2026) |
| Course system | 4 | General Mathematical Statistics       | SIT3100     | Third level (2025-2026) |
| Course system | 4 | Nonlinear Regression Analysis         | SIT3120     | Third level (2025-2026) |
| Course system | 4 | General Biostatistics                 | SIT3140     | Third level (2025-2026) |
| Course system | 4 | Computer Applications (R Language)    | SIT3121     | Third level (2025-2026) |
| Course system | 4 | Data Mining                           | SIT313      | Third level (2025-2026) |
| Course system | 4 | Queueing Theory                       | SIT315      | Third level (2025-2026) |
| Course system | 4 | Summer training2                      | SIT3122     | Third level (2025-2026) |

| 6..Program description |   |                                     |             |                         |
|------------------------|---|-------------------------------------|-------------|-------------------------|
| Credit Hours           |   | Course Name                         | Course Code | Year/Level              |
| Course system          | 4 | Experimental Design 1               | SIT411      | Forth level (2025-2026) |
| Course system          | 4 | Design of Agricultural Experiments  | SIT4110     | Forth level (2025-2026) |
| Course system          | 4 | Random Processes                    | SIT412      | Forth level (2025-2026) |
| Course system          | 4 | Principles of Statistical Inference | SIT413      | Forth level (2025-2026) |
| Course system          | 4 | Statistical Inference               | SIT4130     | Forth level (2025-2026) |
| Course system          | 4 | Nonparametric Methods               | SIT414      | Forth level (2025-2026) |
| Course system          | 4 | Multivariate 1                      | SIT415      | Forth level (2025-2026) |
| Course system          | 4 | Random Multivariate                 | SIT4150     | Forth level (2025-2026) |
| Course system          | 4 | Artificial Intelligence             | 7SIT41      | Forth level (2025-2026) |
| Course system          | 2 | Research Project                    | SIT418      | Forth level (2025-2026) |
| Course system          | 4 | Information Theory                  | SIT416      | Forth level (2025-2026) |
| Course system          | 4 | Machine Learning                    | SIT419      | Forth level (2025-2026) |

| 6..Program description |   |                            |             |                         |
|------------------------|---|----------------------------|-------------|-------------------------|
| Credit Hours           |   | Course Name                | Course Code | Year/Level              |
| Bologna track          | 5 | Accounting Principles      | TCMM106     | First level (2025-2026) |
| Bologna track          | 6 | Principles of Mathematics  | SIT108      | First level (2025-2026) |
| Bologna track          | 2 | Democracy and Human Rights | NTU100      | First level (2025-2026) |
| Bologna track          | 2 | English Language           | NTU101      | First level (2025-2026) |

|               |   |                           |         |                         |
|---------------|---|---------------------------|---------|-------------------------|
| Bologna track | 5 | Principles of Statistics  | TCMM105 | First level (2025-2026) |
| Bologna track | 4 | Index Numbers             | SIT110  | First level (2025-2026) |
| Bologna track | 2 | SPSS Applications         | SIT109  | First level (2025-2026) |
| Bologna track | 2 | Minitab Applications      | SIT114  | First level (2025-2026) |
| Bologna track | 5 | Statistical Applications  | SIT111  | First level (2025-2026) |
| Bologna track | 5 | Principles of Economics   | TCMM107 | First level (2025-2026) |
| Bologna track | 4 | Mathematical Applications | SIT112  | First level (2025-2026) |
| Bologna track | 5 | Principles of Management  | TCMM104 | First level (2025-2026) |
| Bologna track | 3 | Computer                  | NTU102  | First level (2025-2026) |
| Bologna track | 1 | Arabic Language           | NTU103  | First level (2025-2026) |
| Bologna track | 4 | Introduction in R         | SIT113  | First level (2025-2026) |

| 6..Program description |   |                                    |             |                          |
|------------------------|---|------------------------------------|-------------|--------------------------|
| Credit Hours           |   | Course Name                        | Course Code | Year/Level               |
| Bologna track          | 5 | Linear Algebra                     | SIT205      | Second level (2025-2026) |
| Bologna track          | 6 | Numerical Analysis                 | SIT206      | Second level (2025-2026) |
| Bologna track          | 2 | Crimes of the baath regime in Iraq | NTU 200     | Second level (2025-2026) |
| Bologna track          | 2 | Principles of Time Series          | SIT207      | Second level (2025-2026) |
| Bologna track          | 5 | Principles of Probability          | SIT208      | Second level (2025-2026) |
| Bologna track          | 4 | English Language                   | NTU201      | Second level (2025-2026) |
| Bologna track          | 2 | Matlab Applications                | SIT209      | Second level (2025-2026) |
| Bologna track          | 2 | Python Programming                 | SIT210      | Second level (2025-2026) |
| Bologna track          | 5 | Deferential Equations              | SIT211      | Second level (2025-2026) |
| Bologna track          | 5 | Sampling Theory                    | SIT212      | Second level (2025-2026) |
| Bologna track          | 4 | Hypotheses Testing                 | SIT213      | Second level (2025-2026) |
| Bologna track          | 5 | Computer                           | NTU202      | Second level (2025-2026) |
| Bologna track          | 3 | Time Series                        | SIT215      | Second level (2025-2026) |
| Bologna track          | 1 | Probability                        | SIT214      | Second level (2025-2026) |
| Bologna track          | 4 | Arabic Language                    | NTU203      | Second level (2025-2026) |
| Bologna track          |   | Summer training                    | SIT216      | Second level (2025-2026) |

| 7. Program structure |                 |            |                   |                            |
|----------------------|-----------------|------------|-------------------|----------------------------|
| Notes *              | Unit Percentage | Study unit | Number of Courses | Program Structure          |
| Bologna + Courses    |                 | 27         | 9                 | Institutional Requirements |
| Bologna Track        |                 | 24         | 4                 | College Requirements       |
| Courses only         |                 | 80         | 30                | Department Requirements    |
|                      |                 | Nothing    | 2                 | Summer Training            |

|  |  |  |  |       |
|--|--|--|--|-------|
|  |  |  |  | Other |
|--|--|--|--|-------|

\*The possibility of including what was the basic or optional course.

| <b>8.Expected learning outcomes of the program.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>Knowledge</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
| <p><b>Graduates of the Department of Statistics and Information Technology are qualified to use a variety of statistical programs, enabling them to:</b></p> <ol style="list-style-type: none"> <li><b>1 .Possess the ability to provide statistical consultations to researchers, government departments, and institutions in various fields of applied science.</b></li> <li><b>2.Process and analyze a variety of data statistically, extracting and interpreting statistical indicators.</b></li> <li><b>3. Prepare reports and statistical studies related to various activities.</b></li> <li><b>4. Possess the ability to use modern statistical software.</b></li> <li><b>5. Contribute to the preparation and verification of computer data entry.</b></li> <li><b>6. Possess the ability to organize training courses in their field of expertise.</b></li> <li><b>7. Qualified to complete their postgraduate studies inside and outside Iraq.</b></li> </ol> |  |
| <b>Skills</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| <ol style="list-style-type: none"> <li>1. Interpret results in a language understandable to non-experts.</li> <li>2. Work collaboratively with multidisciplinary teams, such as marketing or IT.</li> <li>3. Prepare reports and presentations in a professional and clear manner.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| <b>Values</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| <p style="text-align: right;"><b>1– 1Accuracy and Objectivity</b></p> <ol style="list-style-type: none"> <li>a. Commitment to the utmost accuracy in data analysis and interpretation.</li> <li>b. Objectivity in presenting results without bias or falsification of facts.</li> </ol> <p style="text-align: right;"><b>2– Confidentiality and Scientific Integrity</b></p> <ol style="list-style-type: none"> <li>a. Respecting the privacy of data and information, especially in studies related to health or individuals.</li> <li>b. Scientific integrity in documentation, attribution, and avoiding plagiarism or misuse of results.</li> </ol> <p><b>3– Critical and Logical Thinking</b></p> <ol style="list-style-type: none"> <li>a. Using logical reasoning to interpret phenomena based on evidence.</li> </ol>                                                                                                                                            |  |

b. Analyzing problems systematically, not relying solely on intuition.

4- Commitment to Quality and Professionalism

a. a. Providing high-quality statistical work that adheres to academic and professional standards.

b. Attention to detail and work with extreme precision

**9. Teaching and Learning Strategies**

- 1- Explain the scientific material to students in detail.
- 2- Involve students in solving mathematical problems.
- 3- Discuss and discuss vocabulary related to the topic.

**10. Evaluation methods**

**Weekly, monthly, daily and end of year exams.**

**11. Faculty**

**Faculty members**

| Number of Faculty Members |           | Requirements/Special Skills (if any) |  | Specialization     |            | Academic Rank       |
|---------------------------|-----------|--------------------------------------|--|--------------------|------------|---------------------|
| lecture                   | property, |                                      |  | private            | Public     |                     |
|                           | property, |                                      |  | Applied Statistics | Statistics | Assistant Professor |
|                           | property, |                                      |  | Applied Statistics | Statistics | Assistant Professor |

|  |           |  |  |                    |             |                     |
|--|-----------|--|--|--------------------|-------------|---------------------|
|  | property, |  |  | Applied Statistics | Statistics  | Assistant Professor |
|  | property, |  |  | Pure Mathematics   | Mathematics | Lecturer            |
|  | property, |  |  | Applied Statistics | Statistics  | Lecturer            |
|  | property, |  |  | Applied Statistics | Statistics  | Lecturer            |
|  | property, |  |  | Applied Statistics | Statistics  | Assistant Lecturer  |
|  | property, |  |  | Pure Mathematics   | Mathematics | Assistant Lecturer  |
|  | property, |  |  | Media              | Media       | Assistant Lecturer  |

## 12. Professional development

### Orientation of new faculty members

Training courses in the field of specialization  
 Courses on teaching and learning  
 Courses on how to publish scientific research

### Professional development for faculty members

Training courses in the field of specialization  
 Developing scientific publishing skills

## 13. Acceptance standard

Central admission

## 14. The most important sources of information about the program

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1- The official website of the university or college</p> <ul style="list-style-type: none"> <li>•The primary source for obtaining:</li> <li>•Program curriculum</li> <li>•Course descriptions</li> <li>•Admission and graduation requirements</li> <li>•Faculty names</li> <li>•Research projects and graduation topics</li> </ul> <p>2- Student Academic Handbook</p> <ul style="list-style-type: none"> <li>•Usually published by the college or department.</li> <li>•Program objectives</li> <li>•Expected skills and outcomes</li> <li>•Graduation requirements</li> <li>•Assessment and grading system</li> <li>•Required academic and behavioral values</li> </ul> <p>3- Course Description –1</p> <ul style="list-style-type: none"> <li>•Contains details for each subject :</li> <li>•Objectives</li> <li>•Course Content</li> <li>•Skills Acquired</li> <li>•Course References</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| 15- Program Development Plan                        |               |                                                                                                                        |                                |  |
|-----------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------|--|
| Responsible authorities                             | Timeframe     | Proposed activities                                                                                                    | Theme                          |  |
| Curriculum Committee, Faculty Members               | Continuous    | - Revising the curriculum. - Introducing courses such as data analysis, machine learning, and data science.            | 1- Curriculum Update           |  |
| College Administration, Information Technology Unit | Continuous    | - Updating laboratories. - Equipping the department with the latest software (such as Python, R, Power BI, and SPSS).  | 2- Infrastructure Development  |  |
| Training and Development Division                   | Continuous    | - Holding workshops for faculty members. - Sending instructors to external courses.                                    | 3- Training and Development    |  |
| Qualification and Employment Unit                   | Continuous    | - Signing agreements with companies and government institutions. - Implementing summer training programs for students. | 4- Linking to the Labor Market |  |
| Scientific Research Committee                       | Annually      | - Supporting applied graduation projects. - Funding joint research with other departments.                             | 5- Scientific Research         |  |
| Quality Assurance Division                          | Each semester | - Periodic program evaluation. - Surveys to measure student and graduate satisfaction.                                 | 6- Quality Assurance           |  |



| 16- Program skills chart                  |    |    |    |        |    |    |    |           |    |    |    |                  |                            |             |                          |
|-------------------------------------------|----|----|----|--------|----|----|----|-----------|----|----|----|------------------|----------------------------|-------------|--------------------------|
| Required learning outcomes of the program |    |    |    |        |    |    |    |           |    |    |    |                  |                            |             |                          |
| values                                    |    |    |    | skills |    |    |    | Knowledge |    |    |    | Core or Optional | Course Name                | Course Code | Year/Level Course        |
| C4                                        | C3 | C2 | C1 | B4     | B3 | B2 | B1 | A4        | A3 | A2 | A1 |                  |                            |             |                          |
|                                           |    |    |    |        |    |    |    |           |    |    |    | Basic            | Accounting Principles      | TCMM106     | First Level<br>2025-2026 |
| √                                         | √  | √  | √  | √      | √  | √  | √  | √         | √  | √  | √  | Basic            | Principles of Mathematics  | SIT108      | First Level<br>2025-2026 |
|                                           |    |    |    |        |    |    |    |           |    |    |    | Basic            | Democracy and Human Rights | NTU100      | First Level<br>2025-2026 |
|                                           |    |    |    |        |    |    |    |           |    |    |    | Basic            | English Language           | NTU101      |                          |
| √                                         | √  | √  | √  | √      | √  | √  | √  | √         | √  | √  | √  | Basic            | Principles of Statistics   | TCMM105     | First Level<br>2025-2026 |
| √                                         | √  | √  | √  | √      | √  | √  | √  | √         | √  | √  | √  | Basic            | Index Numbers              | SIT110      |                          |
|                                           |    | √  | √  |        |    | √  | √  |           |    | √  | √  | Optional         | SPSS Applications          | SIT109      | First Level<br>2025-2026 |
|                                           |    | √  | √  |        |    | √  | √  |           |    | √  | √  | Optional         | Minitab Applications       | SIT114      |                          |

|   |   |   |   |   |   |   |   |   |   |   |   |       |                                     |         |                           |
|---|---|---|---|---|---|---|---|---|---|---|---|-------|-------------------------------------|---------|---------------------------|
|   |   | √ | √ |   |   | √ | √ |   |   | √ | √ | Basic | Statistical Applications            | SIT111  | First Level<br>2025-2026  |
|   |   |   |   |   |   |   |   |   |   |   |   | Basic | Principles of Economics             | TCMM107 | First Level<br>2025-2026  |
| √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | Basic | Mathematical Applications           | SIT112  | First Level<br>2025-2026  |
|   |   |   |   |   |   |   |   |   |   |   |   | Basic | Principles of Management            | TCMM104 | First Level<br>2025-2026  |
|   |   |   |   |   |   |   |   |   |   |   |   | Basic | Computer                            | NTU102  | First Level<br>2025-2026  |
|   |   |   |   |   |   |   |   |   |   |   |   | Basic | Arabic Language                     | NTU103  | First Level<br>2025-2026  |
|   |   | √ | √ |   |   | √ | √ |   |   | √ | √ | Basic | Introduction in R                   | SIT113  | First Level<br>2025-2026  |
|   |   |   |   |   |   |   |   |   |   |   |   | Basic | English 2                           | NTU200  | Second Level<br>2025-2026 |
|   |   |   |   |   |   |   |   |   |   |   |   | Basic | Crimes of the Ba'ath Regime in Iraq | NTU203  | Second Level<br>2025-2026 |
|   |   | √ | √ |   | √ | √ | √ | √ | √ | √ | √ | Basic | Principles of Probability           | SIT208  | Second Level<br>2025-2026 |

|   |   |   |   |   |   |   |   |   |   |   |   |       |                                  |         |                           |
|---|---|---|---|---|---|---|---|---|---|---|---|-------|----------------------------------|---------|---------------------------|
| √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | Basic | Sampling Theory                  | SIT212  | Second Level<br>2025-2026 |
| √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | Basic | Linear Algebra                   | SIT205  | Second Level<br>2025-2026 |
| √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | Basic | Principles of Time Series        | SIT2207 | Second Level<br>2025-2026 |
| √ | √ | √ | √ | √ | √ | √ | √ | √ |   | √ | √ | Basic | Differential Equations           | SIT211  | Second Level<br>2025-2026 |
|   |   | √ | √ |   | √ | √ | √ | √ | √ | √ | √ | Basic | Numerical Analysis               | SIT206  | Second Level<br>2025-2026 |
| √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | Basic | General Time Series              | SIT215  | Second Level<br>2025-2026 |
|   |   | √ | √ |   | √ | √ | √ | √ | √ | √ | √ | Basic | Probability and Random Variables | SIT214  | Second Level<br>2025-2026 |
| √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | Basic | Hypothesis Testing               | SIT213  | Second Level<br>2025-2026 |
|   |   |   |   |   |   |   |   |   |   |   |   |       | Summer Training 1                | SIT211  | Second Level<br>2025-2026 |
|   |   |   |   |   |   |   |   |   |   |   |   |       | English Language 3               | NTU300  | Third Level<br>2025-2026  |

|   |   |   |   |   |   |   |   |   |   |   |   |       |                                       |         |                       |
|---|---|---|---|---|---|---|---|---|---|---|---|-------|---------------------------------------|---------|-----------------------|
|   |   | √ | √ |   |   | √ | √ |   |   | √ | √ | Basic | Principles of Mathematical Statistics | SIT310  | Third Level 2025-2026 |
|   |   | √ | √ |   |   | √ | √ |   |   | √ | √ | Basic | Operations Research                   | SIT311  | Third Level 2025-2026 |
|   |   | √ | √ |   |   | √ | √ |   |   | √ | √ | Basic | Linear Regression Analysis            | SIT312  | Third Level 2025-2026 |
| √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | Basic | Principles of Biostatistics           | SIT314  | Third Level 2025-2026 |
|   |   | √ | √ |   |   | √ | √ |   |   | √ | √ | Basic | Reliability                           | SIT316  | Third Level 2025-2026 |
|   |   | √ | √ |   |   | √ | √ |   |   | √ | √ | Basic | General Mathematical Statistics       | SIT310  | Third Level 2025-2026 |
|   |   | √ | √ |   |   | √ | √ |   |   | √ | √ | Basic | Nonlinear Regression Analysis         | SIT3120 | Third Level 2025-2026 |
| √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | Basic | General Biostatistics                 | SIT3140 | Third Level 2025-2026 |
|   |   |   |   |   |   |   |   |   |   |   |   |       | Data Mining                           | SIT313  | Third Level 2025-2026 |
|   | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | Basic | Queuing Theory                        | SIT315  | Third Level 2025-2026 |

|   |   |   |   |   |   |   |   |   |   |   |   |       |                                     |         |                       |
|---|---|---|---|---|---|---|---|---|---|---|---|-------|-------------------------------------|---------|-----------------------|
|   |   |   |   |   |   |   |   |   |   |   |   |       | Summer Training 2                   | SIT312  | Third Level 2025-2026 |
| √ | √ | √ | √ |   | √ | √ | √ |   | √ | √ | √ | Basic | Experimental Design 1               | SIT411  | Forth Level 2025-2026 |
| √ | √ | √ | √ |   | √ | √ | √ |   | √ | √ | √ | Basic | Design of Agricultural Experiments  | SIT410  | Forth Level 2025-2026 |
| √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | Basic | Random Processes                    | SIT412  | Forth Level 2025-2026 |
| √ | √ | √ | √ |   | √ | √ | √ |   | √ | √ | √ | Basic | Principles of Statistical Inference | SIT413  | Forth Level 2025-2026 |
| √ | √ | √ | √ |   | √ | √ | √ |   | √ | √ | √ | Basic | Statistical Inference               | SIT4130 | Forth Level 2025-2026 |
|   |   | √ | √ |   | √ | √ | √ | √ | √ | √ | √ | Basic | Nonparametric Methods               | SIT414  | Forth Level 2025-2026 |
|   |   | √ | √ |   | √ | √ | √ | √ | √ | √ | √ | Basic | Multivariate 1                      | SIT415  | Forth Level 2025-2026 |
|   |   | √ | √ |   |   | √ | √ |   |   | √ | √ | Basic | Multivariate Random                 | SIT4150 | Forth Level 2025-2026 |
|   |   |   | √ |   |   |   | √ |   |   |   | √ | Basic | Artificial Intelligence             | SIT417  | Forth Level 2025-2026 |

|  |  |  |   |  |  |  |   |  |  |  |   |          |                    |        |                       |
|--|--|--|---|--|--|--|---|--|--|--|---|----------|--------------------|--------|-----------------------|
|  |  |  |   |  |  |  |   |  |  |  |   |          | Research Project   | SIT418 | Forth Level 2025-2026 |
|  |  |  |   |  |  |  |   |  |  |  |   | Optional | Information Theory | SIT416 | Forth Level 2025-2026 |
|  |  |  | √ |  |  |  | √ |  |  |  | √ | Basic    | Machine Learning   | SIT419 | Forth Level 2025-2026 |

- Please tick the boxes corresponding to the individual learning outcomes of the program being evaluated.

## Principles of Mathematics

|                                                                               |                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Course Name:                                                               |                                                                                                                                                                                                                                                                                                                                               |
| Principles of Mathematics                                                     |                                                                                                                                                                                                                                                                                                                                               |
| 2. Course Code:                                                               |                                                                                                                                                                                                                                                                                                                                               |
| SIT124                                                                        |                                                                                                                                                                                                                                                                                                                                               |
| 3. Semester / Year:                                                           |                                                                                                                                                                                                                                                                                                                                               |
| The first semester 2025-2026                                                  |                                                                                                                                                                                                                                                                                                                                               |
| 4. Description Preparation Date:                                              |                                                                                                                                                                                                                                                                                                                                               |
| 2025/6/1                                                                      |                                                                                                                                                                                                                                                                                                                                               |
| 5. Available Attendance Forms:                                                |                                                                                                                                                                                                                                                                                                                                               |
| Weekly                                                                        |                                                                                                                                                                                                                                                                                                                                               |
| 6. Number of Credit Hours (Total) / Number of Units (Total)                   |                                                                                                                                                                                                                                                                                                                                               |
| 56 hours (4 hours * 14 weeks)                                                 |                                                                                                                                                                                                                                                                                                                                               |
| 7. Course administrator's name (mention all, if more than one name)           |                                                                                                                                                                                                                                                                                                                                               |
| Name: Fardous Najeeb Abdullah Mohammad Al-Rawi                                |                                                                                                                                                                                                                                                                                                                                               |
| Email: <a href="mailto:frdoos_najeeb@ntu.edu.iq">frdoos_najeeb@ntu.edu.iq</a> |                                                                                                                                                                                                                                                                                                                                               |
| 8. Course Objectives                                                          |                                                                                                                                                                                                                                                                                                                                               |
| <b>Course Objectives</b>                                                      | <b>Fundamental Concepts:</b><br><br>1. Understand and apply basic mathematical principles including algebra, trigonometry, and calculus.<br><br>2. Develop a strong foundation in mathematical reasoning and problem-solving skills.<br><br><b>Analytical Skills:</b><br><br>1. Enhance analytical thinking through mathematical modeling and |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>analysis.</p> <p>2.Learn to formulate and solve problems using mathematical techniques.</p> <p>Computational Proficiency:</p> <p>3.Gain proficiency in using mathematical software and tools for computation.</p> <p>4.Develop skills in numerical methods and algorithms relevant to IT applications.</p> <p><b>Mathematics in IT:</b></p> <p>1.Understand the role of mathematics in various IT disciplines such as computer science, data analysis, and network theory.</p> <p>2.Apply mathematical concepts to solve real-world IT problems.</p> <p>Discrete Mathematics:</p> <p>3.Introduction to discrete mathematics, including logic, set theory, combinatorics, graph theory, and Boolean algebra.</p> <p>4.Understand the significance of discrete structures in computer science and IT.</p> <p><b>Statistics and Probability:</b></p> <p>1.Learn the basics of statistics and probability theory.</p> <p>2.Apply statistical methods to analyze data and make informed</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | <p>decisions in IT contexts.</p> <p><b>Linear Algebra:</b></p> <ol style="list-style-type: none"> <li>1. Understand and apply concepts of vectors, matrices, and linear transformations.</li> <li>2. Use linear algebra in applications such as computer graphics, machine learning, and data processing.</li> </ol> <p><b>:Mathematical Communication:</b></p> <ol style="list-style-type: none"> <li>1. Develop the ability to communicate mathematical ideas effectively, both orally and in writing.</li> <li>2. Interpret and present mathematical data clearly and concisely.</li> </ol> <p><b>Critical Thinking:</b></p> <ol style="list-style-type: none"> <li>1. Foster critical thinking and logical reasoning through mathematical proofs and problem-solving exercises.</li> <li>2. Encourage independent thinking and the ability to tackle complex mathematical challenges.</li> </ol> |
| 9. Teaching and Learning Strategies |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Strategy</b>                     | The strategies aim to create an engaging and supportive learning environment that encourages active participation and critical thinking, ultimately helping students to develop a strong foundation in mathematics and its applications in IT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| 10. Course Structure |       |                                     |                                                   |                           |                         |
|----------------------|-------|-------------------------------------|---------------------------------------------------|---------------------------|-------------------------|
| Week                 | Hours | Required Learning Outcomes          | Unit or subject name                              | Learning method           | Evaluation method       |
| 1                    | 4     | Student understanding of the lesson | Groups                                            | Theoretical and practical | Daily and monthly tests |
| 2                    | 4     | =                                   | Coordinates                                       | =                         | =                       |
| 3                    | 4     | =                                   | The rate of change of distance between two points | =                         | =                       |
| 4                    | 4     | =                                   | Slope of a straight line and its equation         | =                         | =                       |
| 5                    | 4     | =                                   | The function and its graph                        | =                         | =                       |
| 6                    | 4     | =                                   | the limit                                         | =                         | =                       |

|                                                                                                                                                                     |   |   |                                                               |   |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---------------------------------------------------------------|---|---|
| 7                                                                                                                                                                   | 4 | = | Continuity                                                    | = | = |
| 8                                                                                                                                                                   | 4 | = | Derivative of algebraic functions                             | = | = |
| 9                                                                                                                                                                   | 4 | = | The second derivative and higher orders                       | = | = |
| 10                                                                                                                                                                  | 4 | = | Derivative of implicit functions                              | = | = |
| 11                                                                                                                                                                  | 4 | = | Definite integral                                             | = | = |
| 12                                                                                                                                                                  | 4 | = | Indefinite integration                                        | = | = |
| 13                                                                                                                                                                  | 4 | = | Differentiation of the exponential function                   | = | = |
| 14                                                                                                                                                                  | 4 | = | Natural logarithm                                             | = | = |
| 15                                                                                                                                                                  | 4 | = | <b>week before the final Exam</b>                             | = | = |
| 11. Course Evaluation                                                                                                                                               |   |   |                                                               |   |   |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc |   |   |                                                               |   |   |
| 12. Learning and Teaching Resources                                                                                                                                 |   |   |                                                               |   |   |
| Required textbooks (curricular books, if any)                                                                                                                       |   |   |                                                               |   |   |
| Main references (sources)                                                                                                                                           |   |   | Calculus Part Two Dr. Mohamed Adel Sudan and Dr. Ali Abdullah |   |   |

|                                                                       |                                                              |
|-----------------------------------------------------------------------|--------------------------------------------------------------|
| Recommended books and references<br>(scientific journals, reports...) | Calculus: Early Transcendentals" by James Stewart            |
| Electronic References, Websites                                       | <a href="http://www.khanacademy.org">www.khanacademy.org</a> |

## Principles of Statistics

|                                                               |                           |                                                                          |                                                                                                               |       |       |
|---------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------|-------|
| 1. Educational Institution                                    |                           |                                                                          |                                                                                                               |       |       |
| Mosul Administrative Technical College                        |                           |                                                                          |                                                                                                               |       |       |
| 2. Academic Department                                        |                           |                                                                          |                                                                                                               |       |       |
| Statistical and Informatics Techniques                        |                           |                                                                          |                                                                                                               |       |       |
| 3. Course Title/Code                                          |                           |                                                                          |                                                                                                               |       |       |
| Principles of Statistics / ATC121                             |                           |                                                                          |                                                                                                               |       |       |
| 4. Available Attendance Formats                               |                           |                                                                          |                                                                                                               |       |       |
| In-Person                                                     |                           |                                                                          |                                                                                                               |       |       |
| 5. Semester/Year                                              |                           |                                                                          |                                                                                                               |       |       |
| First Semester/First Year                                     |                           |                                                                          |                                                                                                               |       |       |
| 6. Number of Academic Hours (Total)                           |                           |                                                                          |                                                                                                               |       |       |
| 4.56                                                          |                           |                                                                          |                                                                                                               |       |       |
| 7. Date this Description Was Prepared                         |                           |                                                                          |                                                                                                               |       |       |
| 2025/14/6                                                     |                           |                                                                          |                                                                                                               |       |       |
| 8 .Course outcomes, teaching, learning and assessment methods |                           |                                                                          |                                                                                                               |       |       |
| Assessment Methods                                            |                           | Teaching and Learning Methods                                            | Learning Outcomes (LOs)                                                                                       |       |       |
| - Short Written Tests - Assignments                           |                           | - Theoretical Lectures - Interactive Explanation with Real-Life Examples | 1. Understand the concept of statistical principles.                                                          |       |       |
| - Midterm Exam - Reports                                      |                           | - Demonstration Presentations - Classroom Discussions                    | 2. Uses of statistics in social, administrative, medical, and other diverse fields.                           |       |       |
| - Homework - Final Exam                                       |                           | - Practical Classroom Exercises - Solving Hands-on Exercises Using Rules | 3. Requirements of statistics and how to calculate them.                                                      |       |       |
| - Homework - Final Exam                                       |                           | - Practical Classroom Exercises - Solving Hands-on Exercises Using Rules | 4. Apply mathematical formulas for statistics, and understand scientific terminology and statistical symbols. |       |       |
| 9. Course structure (theoretical and practical vocabulary)    |                           |                                                                          |                                                                                                               |       |       |
| Evaluation method                                             | Teaching method           | Unit name/topic                                                          | Required learning outcomes                                                                                    | hours | Week  |
| Presentation, explanation, questions and answers, discussion  | Theoretical and practical | Definition of Statistics                                                 | Student understanding of the lesson                                                                           | 4     | First |

|                                                              |                           |                                    |                                     |   |          |
|--------------------------------------------------------------|---------------------------|------------------------------------|-------------------------------------|---|----------|
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Data and Variables                 | Student understanding of the lesson | 4 | Second   |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Data Collection Sources            | Student understanding of the lesson | 4 | Third    |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Data Collection Method             | Student understanding of the lesson | 4 | Fourth   |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Tabular Data Presentation          | Student understanding of the lesson | 4 | Fifth    |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | The mediator and the mode          | Student understanding of the lesson | 4 | Sixth    |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Skewness Forms                     | Student understanding of the lesson | 4 | Seventh  |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Geometric Mean                     | Student understanding of the lesson | 4 | Eighth   |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Harmonic Mean                      | Student understanding of the lesson | 4 | Ninth    |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Quarters, Deciles, and Percentiles | Student understanding of the lesson | 4 | Tenth    |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Range and Half-Range               | Student understanding of the lesson | 4 | Eleventh |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Mean Deviation                     | Student understanding of the lesson | 4 | Twelfth  |

|                                                              |                           |                                 |                                     |   |            |
|--------------------------------------------------------------|---------------------------|---------------------------------|-------------------------------------|---|------------|
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Variance and Standard Deviation | Student understanding of the lesson | 4 | Thirteenth |
| Presentation, explanation, questions and answers, discussion | Theoretical and practical | Correlation and Regression      | Student understanding of the lesson | 4 | Fourteenth |
|                                                              |                           | Final Exam                      |                                     | 3 | Fifteenth  |

## 11. Curriculum development plan.

### Course Development Plan Objectives

- .1The researcher's ability to perform statistical analysis and interpret results correctly.
- .2The student's ability to illustrate data through graphics using statistical software.
- .3The student's ability to conduct opinion polls and process results.
- .4The ability to acquire the use of mathematical methods and statistical theories.

## 12. Infrastructure

|                                                    |                                                                          |
|----------------------------------------------------|--------------------------------------------------------------------------|
| Available                                          | Classrooms, Laboratories, and Workshops                                  |
| Available                                          | 1- Required Textbooks                                                    |
| Principles of Statistics, Taha Hussein Al-Zubaidi. | 2- Main References (Resources)                                           |
| Not available                                      | a) Recommended books and references (scientific journals, reports, etc.) |
| Not available                                      | b) Electronic references, websites, etc.                                 |

## Course description form Standard Numbers

|                                               |
|-----------------------------------------------|
| 1. Educational Institution:                   |
| Administrative Technical College - Mosul      |
| 2. Academic Department:                       |
| Department of Statistics and Informatics      |
| 3. Course Title/Code: Standard Numbers/SIT125 |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 4. Available Attendance Formats:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Weekly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 5. Semester/Year:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| First Semester: 2025-2026                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 6. Number of Study Hours (Total):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 60 hours (4 hours * 15 weeks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 7. Date of Preparation:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1, 2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 8 Course objectives (general objectives of the course): The course aims to enable the student in statistical applications in the field of economic studies, through which the economic conditions of different countries can be identified by studying the economic changes in the country or countries under stud. To help predict what might happen to various variables in the future, it is also used to measure various phenomena, such as comparing food prices in a given year with those of a previous or future year. |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 10· Learning Outcomes, Teaching ,Learning and Assessment Methode                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Evaluation methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Teaching and learning methods                                   | <p>A- Knowledge and Understanding</p> <p>A1- Defining the concept of index numbers, their types, formulas and mathematical laws.</p> <p>A2- Index numbers and the methodology for their application in economic activities</p> <p>A3- Defining the phenomenon and how to choose its vocabulary .</p> <p>A4- Creating index numbers by specifying the commodities covered and determining the base and comparison period .</p> <p>A5- Using technical and scientific development in the field of record numbers.</p> <p>A6- Index numbers are considered one of the most important statistical analysis tools that reveal the true reality of the level of economic and financial indicators.</p> |
| Exams and discussions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | The theoretical lectures include various mathematical problems. | <p>B. Subject-specific skills</p> <p>B1 - The student's ability to calculate index numbers to explain a particular phenomenon or problem .</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                       |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       |                                                                 | <p>B2 - The student's ability to compose index numbers is to choose the base period that is used to compose the index number. Usually, the base period precedes the comparison period .</p> <p>B3 - The student's ability to compare prices and quantities of different goods in a specific year with another previous year in order to determine the development that has occurred in production.</p> <p>B4- Studying indices helps in forecasting the .studied phenomenon</p> |
| Exams and discussions | The theoretical lectures include various mathematical problems. | Teaching and Learning Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Exams and discussions | The theoretical lectures include various mathematical problems. | <p>1-theoretical lectures include various computational problems.</p> <p>2-practical application using statistical programs such as SPSS program.</p>                                                                                                                                                                                                                                                                                                                           |

## 11. Course Structure

| 11. Course Structure |       |                                     |                                                                                                                                |                           |                         |
|----------------------|-------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------|
| Week ILOs            | Hours | ILOs                                | Unit/Module or Topic Title                                                                                                     | Teaching Method           | Assessment Method       |
| First                | 4     | Student understanding of the lesson | Definition of the index + areas of use of the index + index level                                                              | Theoretical and practical | Daily and monthly tests |
| Second               | 4     | =                                   | Composition of numbers (levels method + simple grouping method)                                                                | =                         | =                       |
| Third                | 4     | =                                   | Simple index numbers methods (quantity and price levels + the arithmetic mean of the price and quantity levels)                | =                         | =                       |
| Fourth               | 4     | =                                   | The simple arithmetic mean formula for prices and quantities + the simple geometric mean formula for price and quantity levels | =                         | =                       |
| Fifth                | 4     | =                                   | Simple assembly method                                                                                                         | =                         | =                       |
| VI                   | 4     | =                                   | Aggregate arithmetic mean method for price levels and quantities                                                               | =                         | =                       |
| Seventh              | 4     | =                                   | Weighted index numbers                                                                                                         | =                         | =                       |
| VIII                 | 4     | =                                   | Weighted index formulas                                                                                                        | =                         | =                       |
| Ninth                | 4     | =                                   | Changes in weights                                                                                                             | =                         | =                       |
| The tenth            | 4     | =                                   | Weighted average index numbers using commodity values                                                                          | =                         | =                       |

|                                                                                                                                                                                                                                                                                                                           |   |   |                                                     |                                                                          |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|-----------------------------------------------------|--------------------------------------------------------------------------|---|
| Eleventh                                                                                                                                                                                                                                                                                                                  | 4 | = | Standard numbers using a series or moving basis     | =                                                                        | = |
| Twelveth                                                                                                                                                                                                                                                                                                                  | 4 | = | Standard numbers test                               | =                                                                        | = |
| Thirteenth                                                                                                                                                                                                                                                                                                                | 4 | = | Definition of time series                           | =                                                                        | = |
| Fourteenth                                                                                                                                                                                                                                                                                                                | 4 | = | Relative coefficient of change                      | =                                                                        | = |
| Fifteenth                                                                                                                                                                                                                                                                                                                 | 4 | = | Components of a time series                         | =                                                                        | = |
|                                                                                                                                                                                                                                                                                                                           |   |   |                                                     |                                                                          |   |
| 13. Curriculum Development Plan                                                                                                                                                                                                                                                                                           |   |   |                                                     |                                                                          |   |
| Curriculum development based on recent publications of books and references.                                                                                                                                                                                                                                              |   |   |                                                     |                                                                          |   |
| 14.. Infrastructun                                                                                                                                                                                                                                                                                                        |   |   |                                                     |                                                                          |   |
|                                                                                                                                                                                                                                                                                                                           |   |   | Available                                           | Classrooms, Laboratories, and Workshops                                  |   |
|                                                                                                                                                                                                                                                                                                                           |   |   | Available                                           | 1- Required Textbooks                                                    |   |
|                                                                                                                                                                                                                                                                                                                           |   |   | Records/Abdul Hussein Zini.                         | 2- Main References (Sources)                                             |   |
|                                                                                                                                                                                                                                                                                                                           |   |   | Records/Abdul Hussein Zini.                         | a) Recommended Books and References (Scientific Journals, Reports, etc.) |   |
| <a href="https://www.youtube.com/watch?v=bnXDKMaYLcM&amp;t=106s">https://www.youtube.com/watch?v=bnXDKMaYLcM&amp;t=106s</a>                                                                                                                                                                                               |   |   | <b>,t) Electronic references, websites</b><br>..... |                                                                          |   |
| <a href="https://www.google.iq/books/edition/Index_Numbers_in_Economic_Theory_and_a/KlKrOobYrWgC?hl=ar&amp;gbpv=1&amp;dq=Index+Numbers&amp;printsec=frontcover">https://www.google.iq/books/edition/Index_Numbers_in_Economic_Theory_and_a/KlKrOobYrWgC?hl=ar&amp;gbpv=1&amp;dq=Index+Numbers&amp;printsec=frontcover</a> |   |   |                                                     |                                                                          |   |

## Principles of Economics

|     |                                                                  |
|-----|------------------------------------------------------------------|
| 13. | Course Name:                                                     |
|     | Principles of Economics /                                        |
| 14. | Course Code:                                                     |
|     | TCMM107                                                          |
| 15. | Semester / Year:                                                 |
|     | First semester / 2025-2026                                       |
| 16. | Description Preparation Date:                                    |
|     | 1-9-2025                                                         |
| 17. | Available Attendance Forms:                                      |
|     | Attendance                                                       |
| 18. | Number of Credit Hours (Total) / Number of Units (Total)         |
|     | 60 hour / 6 ECTS                                                 |
| 19. | Course administrator's name (mention all, if more than one name) |
|     | Dr.Ahmed Fathi                                                   |
| 20. | Course Objectives                                                |

|                                                                    |         |                                                   |                                                                                                                                                          |                 |                          |
|--------------------------------------------------------------------|---------|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|
| Course Objectives                                                  |         | هنا                                               |                                                                                                                                                          |                 |                          |
| 21. Teaching and Learning Strategies                               |         |                                                   |                                                                                                                                                          |                 |                          |
| Strategy                                                           |         | هنا                                               |                                                                                                                                                          |                 |                          |
| 22. Course Structure                                               |         |                                                   |                                                                                                                                                          |                 |                          |
| Week                                                               | Hours   | Required Learning Outcomes                        | Unit or subject name                                                                                                                                     | Learning method | Evaluation method        |
| 1                                                                  | 4       | Economic Concepts                                 | Economic Concepts                                                                                                                                        | Exam            | Discussion and Questions |
| 2                                                                  | 4       | Demand theory                                     | Market equilibrium                                                                                                                                       |                 |                          |
| 3                                                                  | 4       | Exam.                                             |                                                                                                                                                          |                 |                          |
| 4                                                                  | 4       | Supply and equilibrium theory                     | Market equilibrium                                                                                                                                       |                 |                          |
| 5                                                                  | 4       | Elasticities of demand and supply                 | Elasticities                                                                                                                                             |                 |                          |
| 6                                                                  | 4       | Exam.                                             |                                                                                                                                                          |                 |                          |
| 7                                                                  | 4       | Consumer demand and utility                       | Consumer demand theory                                                                                                                                   |                 |                          |
| 8                                                                  | 4       | Exam.                                             |                                                                                                                                                          |                 |                          |
| 9                                                                  | 4       | Production function                               | Production Theory                                                                                                                                        |                 |                          |
| 10                                                                 | 4       | Production Costs in the short run                 | Production Costs                                                                                                                                         |                 |                          |
| 11                                                                 | 4       | Exam.                                             |                                                                                                                                                          |                 |                          |
| 12                                                                 | 4       | Production Costs in the long run                  | Production Costs                                                                                                                                         |                 |                          |
| 13                                                                 | 4       | Exam.                                             |                                                                                                                                                          |                 |                          |
| 14-15                                                              | 4       | Perfectly Competitive Market (aggregate analysis) | Markets                                                                                                                                                  |                 |                          |
| 15                                                                 | 4       | Perfectly competitive market (at the unit level)  | Markets                                                                                                                                                  |                 |                          |
| 1. Course Evaluation                                               |         |                                                   |                                                                                                                                                          |                 |                          |
| Type                                                               | Midterm | Final                                             | Markets                                                                                                                                                  |                 |                          |
| Theory                                                             | 50      | 50                                                | Information economics                                                                                                                                    |                 |                          |
| 2. Learning and Teaching Resources                                 |         |                                                   |                                                                                                                                                          |                 |                          |
| Required textbooks (curricular books, if any)                      |         |                                                   | * Salvatore, D., & Diulio, E. A. (2011) Schaum's Outline of Principles of Economics, McGraw-Hill                                                         |                 |                          |
| Main references (sources)                                          |         |                                                   | * Salvatore, Dominic (1992), Theories of Unit Economics: Theories and Questions, Schaum's Abstracts Series, Office of University Publications, Algeria.. |                 |                          |
| Recommended books and references (scientific journals, reports...) |         |                                                   | * Delio, Eugene A., Macroeconomics Theory, Schaum's Outline Series, International House for Publishing and Distribution, Cairo, Egypt                    |                 |                          |
| Electronic References, Websites                                    |         |                                                   |                                                                                                                                                          |                 |                          |
|                                                                    |         |                                                   |                                                                                                                                                          |                 |                          |

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## Mathematical applications

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Course Name:                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Mathematical applications                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Course Code:                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| SIT112                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Semester / Year:                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| The first semester 2025-2026                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Description Preparation Date:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2025/6/1                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Available Attendance Forms:                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Weekly                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Number of Credit Hours (Total) / Number of Units (Total)                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 56 hours (4 hours * 14 weeks)                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Course administrator's name (mention all, if more than one name)                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Name: Fardous Najeeb Abdullah Mohammad Al-Rawi<br>Email: frdoos_najeeb@ntu.edu.iq |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Course Objectives                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Course Objectives                                                                 | <b>Fundamental Concepts:</b><br>1. Understand and apply basic mathematical principles including algebra, trigonometry, and calculus.<br>2. Develop a strong foundation in mathematical reasoning and problem-solving skills.<br><b>Analytical Skills:</b><br>1. Enhance analytical thinking through mathematical modeling and analysis.<br>2. Learn to formulate and solve problems using mathematical techniques.<br>Computational Proficiency: |

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                            |                      |                 |                   |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------|-----------------|-------------------|
|                                  | <div>3.Gain proficiency in using mathematical software and tools for computation.</div> <div>4.Develop skills in numerical methods and algorithms relevant to IT applications.</div> <div>Mathematics in IT:</div> <div>1.Understand the role of mathematics in various IT disciplines such as computer science, data analysis, and network theory.</div> <div>2.Apply mathematical concepts to solve real-world IT problems.</div> <div>Discrete Mathematics:</div> <div>3.Introduction to discrete mathematics, including logic, set theory, combinatorics, graph theory, and Boolean algebra.</div> <div>4.Understand the significance of discrete structures in computer science and IT.</div> <div>Statistics and Probability:</div> <div>1.Learn the basics of statistics and probability theory.</div> <div>2.Apply statistical methods to analyze data and make informed decisions in IT contexts.</div> <div>Linear Algebra:</div> <div>1.Understand and apply concepts of vectors, matrices, and linear transformations.</div> <div>2.Use linear algebra in applications such as computer graphics, machine learning, and data processing.</div> <div>Mathematical Communication:</div> <div>1.Develop the ability to communicate mathematical ideas effectively, both orally and in writing.</div> <div>2.Interpret and present mathematical data clearly and concisely.</div> <div>Critical Thinking:</div> <div>1.Foster critical thinking and logical reasoning through mathematical proofs and problem-solving exercises.</div> <div>2.Encourage independent thinking and the ability to tackle complex mathematical challenges.</div> |                            |                      |                 |                   |
| Teaching and Learning Strategies |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                            |                      |                 |                   |
| Strategy                         | The strategies aim to create an engaging and supportive learning environment that encourages active participation and critical thinking, ultimately helping students to develop a strong foundation in mathematics and its applications in IT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                            |                      |                 |                   |
| Course Structure                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                            |                      |                 |                   |
| Week                             | Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Required Learning Outcomes | Unit or subject name | Learning method | Evaluation method |

|    |   |                                     |                                     |                           |                         |
|----|---|-------------------------------------|-------------------------------------|---------------------------|-------------------------|
| 1  | 4 | Student understanding of the lesson | Exponential function in general     | Theoretical and practical | Daily and monthly tests |
| 2  | 4 | =                                   | Properties of exponential function  | =                         | =                       |
| 3  | 4 | =                                   | Derivative of exponential function  | =                         | =                       |
| 4  | 4 | =                                   | Integration of exponential function | =                         | =                       |
| 5  | 4 | =                                   | Hyperbolic functions                | =                         | =                       |
| 6  | 4 | =                                   | Derivatives of hyperbolic functions | =                         | =                       |
| 7  | 4 | =                                   | Continuity                          | =                         | =                       |
| 8  | 4 | =                                   | Inverse functions                   | =                         | =                       |
| 9  | 4 | =                                   | Properties of inverse functions     | =                         | =                       |
| 10 | 4 | =                                   | Derivative of inverse functions     | =                         | =                       |

|                                                                                                                                                                     |   |   |                                                               |   |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---------------------------------------------------------------|---|---|
| 11                                                                                                                                                                  | 4 | = | Taylor expansion                                              | = | = |
| 12                                                                                                                                                                  | 4 | = | Properties of Taylor expansion                                | = | = |
| 13                                                                                                                                                                  | 4 | = | Methods of integration                                        | = | = |
| 14                                                                                                                                                                  | 4 | = | Methods of integration                                        | = | = |
| 15                                                                                                                                                                  | 4 | = | Methods of integration                                        | = | = |
| Course Evaluation                                                                                                                                                   |   |   |                                                               |   |   |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc |   |   |                                                               |   |   |
| 23. Learning and Teaching Resources                                                                                                                                 |   |   |                                                               |   |   |
| Required textbooks (curricular books, if any)                                                                                                                       |   |   |                                                               |   |   |
| Main references (sources)                                                                                                                                           |   |   | Calculus Part Two Dr. Mohamed Adel Sudan and Dr. Ali Abdullah |   |   |
| Recommended books and references (scientific journals, reports...)                                                                                                  |   |   | Calculus: Early Transcendentals" by James Stewart             |   |   |
| Electronic References, Websites                                                                                                                                     |   |   | www.khanacademy.org                                           |   |   |

## Differential equations

|                                                                      |
|----------------------------------------------------------------------|
| Course Name:                                                         |
| Differential equations                                               |
| Course Code:                                                         |
| SIT226                                                               |
| 24. Semester / Year:                                                 |
| 2025 -2026 Chapter Two                                               |
| 25. Description Preparation Date:                                    |
| 2025/9/1                                                             |
| 26. Available Attendance Forms:                                      |
| Weekly                                                               |
| 27. Number of Credit Hours (Total) / Number of Units (Total)         |
| 56                                                                   |
| 28. Course administrator's name (mention all, if more than one name) |

|                                                                               |       |                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |                         |
|-------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------|
| Name: Fardous Najeeb Abdullah Mohammad Al-Rawi                                |       |                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |                         |
| Email: <a href="mailto:frdoos_najeeb@ntu.edu.ig">frdoos_najeeb@ntu.edu.ig</a> |       |                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |                         |
| 29. Course Objectives                                                         |       |                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |                         |
| Course Objectives                                                             |       |                                                                                                                                                                                                                                                | Recognizing the types of differential equations (ordinary and partial).• Understanding basic terms such as general and particular solutions.Mastering methods of solving differential equations, such as: the analytical method (direct analysis), the method of separable variables, the method of constant coefficients.The ability to apply differential equations in various fields such as physics, engineering, and economics.The ability to model natural phenomena using differential equations.Recognizing numerical methods for solving differential equations . |                           |                         |
| 30. Teaching and Learning Strategies                                          |       |                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |                         |
| Strategy                                                                      |       | The strategies aim to create an engaging and supportive learning environment that encourages active participation and critical thinking, ultimately helping students to develop a strong foundation in mathematics and its applications in IT. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |                         |
| 31. Course Structure                                                          |       |                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |                         |
| Week                                                                          | Hours | Required Learning Outcomes                                                                                                                                                                                                                     | Unit or subject name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Learning method           | Evaluation method       |
| 1                                                                             | 4     | Student understanding of the lesson                                                                                                                                                                                                            | General and particular solutions and forming the equation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Theoretical and practical | Daily and monthly tests |
| 2                                                                             | 4     | Student understanding of the lesson                                                                                                                                                                                                            | First-order and first-degree differential                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Theoretical and practical | Daily and monthly tests |
| 3                                                                             | 4     | Student understanding of the lesson                                                                                                                                                                                                            | equationsMethod of separation of variables                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Theoretical and practical | Daily and monthly tests |
| 4                                                                             | 4     | Student understanding of the lesson                                                                                                                                                                                                            | Exercise solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Theoretical and practical | Daily and monthly tests |
| 5                                                                             | 4     | Student understanding of the lesson                                                                                                                                                                                                            | Homogeneous equations and methods of solving them                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Theoretical and practical | Daily and monthly tests |
| 6                                                                             | 4     | Student understanding of the lesson                                                                                                                                                                                                            | Exact equations and methods of solving                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Theoretical and practical | Daily and monthly tests |
| 7                                                                             | 4     | Student understanding of the lesson                                                                                                                                                                                                            | themIntegrating factor method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Theoretical and practical | Daily and monthly tests |
| 8                                                                             | 4     | Student understanding of the lesson                                                                                                                                                                                                            | Linear differential equations and methods of solving them                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Theoretical and practical | Daily and monthly tests |
| 9                                                                             | 4     | Student understanding of the lesson                                                                                                                                                                                                            | Solve exercises .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Theoretical and practical | Daily and monthly tests |

|                                                                                                                                                                     |   |                                     |                                                                                                                                                                                                                                                                                          |                           |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------|
| 10                                                                                                                                                                  | 4 | Student understanding of the lesson | the exam                                                                                                                                                                                                                                                                                 | Theoretical and practical | Daily and monthly tests |
| 11                                                                                                                                                                  | 4 | Student understanding of the lesson | differential equations in the form of $F(y/)$                                                                                                                                                                                                                                            | Theoretical and practical | Daily and monthly tests |
| 12                                                                                                                                                                  | 4 | Student understanding of the lesson | differential equations in the form of $F(x, y/)$                                                                                                                                                                                                                                         | Theoretical and practical | Daily and monthly tests |
| 13                                                                                                                                                                  | 4 | Student understanding of the lesson | the Lagrange equation                                                                                                                                                                                                                                                                    | Theoretical and practical | Daily and monthly tests |
| 14                                                                                                                                                                  | 4 | Student understanding of the lesson | Solve the exercises                                                                                                                                                                                                                                                                      | Theoretical and practical | Daily and monthly tests |
| 15                                                                                                                                                                  | 4 | Student understanding of the lesson | the semester exam                                                                                                                                                                                                                                                                        | Theoretical and practical | Daily and monthly tests |
| 32. Course Evaluation                                                                                                                                               |   |                                     |                                                                                                                                                                                                                                                                                          |                           |                         |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc |   |                                     |                                                                                                                                                                                                                                                                                          |                           |                         |
| 33. Learning and Teaching Resources                                                                                                                                 |   |                                     |                                                                                                                                                                                                                                                                                          |                           |                         |
| Required textbooks (curricular books, if any)                                                                                                                       |   |                                     |                                                                                                                                                                                                                                                                                          |                           |                         |
| Main references (sources)                                                                                                                                           |   |                                     | Differential Equations / Professor Dr. Hassan Mustafa Al-Awaidi / Part One Dr. Abdul Wahab Abbas Rajab, Dr. Sana Ali Zare' Differential Equations: Richard Branson (Schaum's Series) Theories of Differential Equations, Dr. Rahma Abdul Karim, King Saud University Publications 1408 H |                           |                         |
| Recommended books and references (scientific journals, reports...)                                                                                                  |   |                                     | Differential Equations / Professor Dr. Hassan Mustafa Al-Awaidi / Part One Dr. Abdul Wahab Abbas Rajab, Dr. Sana Ali Zare' Differential Equations: Richard Branson (Schaum's Series) Theories of Differential Equations, Dr. Rahma Abdul Karim, King Saud University Publications 1408 H |                           |                         |
| Electronic References, Websites                                                                                                                                     |   |                                     |                                                                                                                                                                                                                                                                                          |                           |                         |

## linear algebra

|                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| 34.                                                                           | Course Name:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| linear algebra                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| 35.                                                                           | Course Code:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| SIT202                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| 36.                                                                           | Semester / Year:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| First semester                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| 37.                                                                           | Description Preparation Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| 2025/9/1                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| 38.                                                                           | Available Attendance Forms:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| Weekly                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| 39.                                                                           | Number of Credit Hours (Total) / Number of Units (Total)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| 56 hours                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| 40.                                                                           | Course administrator's name (mention all, if more than one name)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| Name: Fardous Najeeb Abdullah Mohammad Al-Rawi                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| Email: <a href="mailto:frdoos_najeeb@ntu.edu.iq">frdoos_najeeb@ntu.edu.iq</a> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| 41.                                                                           | Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| <b>Course Objectives</b>                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | The course aims for the student to be able to:<br>Performing algebraic operations on vectors,<br>learning about the linear equation, as well as the<br>types of matrices and the eight principles of the<br>vector space, algebraic operations on matrices<br>and systems of linear equations, and finally<br>learning about the vector space and the vector<br>.subspace |  |  |
| 42.                                                                           | Teaching and Learning Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| <b>Strategy</b>                                                               | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <ul style="list-style-type: none"> <li>- Encourage participation in class activities and study groups.</li> <li>- Assign practical projects in real-world contexts.</li> <li>- Apply educational software and interactive tools.</li> <li>- Provide online educational resources and short quizzes.</li> <li>- Use graphs and mind maps to clarify concepts.</li> </ul> </div> <div style="width: 45%;"> <ol style="list-style-type: none"> <li>1. Active Learning</li> <li>2. Project-Based Learning</li> <li>3. Use of Technology</li> <li>4. Blended Learning</li> <li>5. Visual Strategies</li> </ol> </div> </div> |                                                                                                                                                                                                                                                                                                                                                                           |  |  |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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|  | <p>6. Collaborative Learning</p> <ul style="list-style-type: none"> <li>- Organize joint study sessions and peer feedback.</li> </ul> <p>7. Understanding-Based Teaching</p> <ul style="list-style-type: none"> <li>- Focus on deep understanding and ask open-ended questions.</li> </ul> <p>8. Assessment Strategies</p> <ul style="list-style-type: none"> <li>- Use formative assessments and comprehensive final exams.</li> </ul> <p>These strategies can be adjusted based on student needs.</p> |
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| 43. Course Structure |       |                                     |                                                                                                           |                           |                         |
|----------------------|-------|-------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------|-------------------------|
| Week                 | Hours | Required Learning Outcomes          | Unit or subject name                                                                                      | Learning method           | Evaluation method       |
| 1                    | 4     | Student understanding of the lesson | Group theory                                                                                              | Theoretical and practical | Daily and monthly tests |
| 2                    | 4     | Student understanding of the lesson | Basic counting methods, permutations                                                                      | Theoretical and practical | Daily and monthly tests |
| 3                    | 4     | Student understanding of the lesson | Combinations                                                                                              | Theoretical and practical | Daily and monthly tests |
| 4                    | 4     | Student understanding of the lesson | Binomial expansion theorem                                                                                | Theoretical and practical | Daily and monthly tests |
| 5                    | 4     | Student understanding of the lesson | Exercises                                                                                                 | Theoretical and practical | Daily and monthly tests |
| 6                    | 4     | Student understanding of the lesson | Polynomial theorem                                                                                        | Theoretical and practical | Daily and monthly tests |
| 7                    | 4     | Student understanding of the lesson | Exams                                                                                                     | Theoretical and practical | Daily and monthly tests |
| 8                    | 4     | Student understanding of the lesson | Probabilities, probability concepts, random experiment, sample/event space, event probability             | Theoretical and practical | Daily and monthly tests |
| 9                    | 4     | Student understanding of the lesson | Field and field algebra                                                                                   | Theoretical and practical | Daily and monthly tests |
| 10                   | 4     | Student understanding of the lesson | Axioms of probability, conditional probability                                                            | Theoretical and practical | Daily and monthly tests |
| 11                   | 4     | Student understanding of the lesson | Independence                                                                                              | Theoretical and practical | Daily and monthly tests |
| 12                   | 4     | Student understanding of the lesson | Random variables and their distributions                                                                  | Theoretical and practical | Daily and monthly tests |
| 13                   | 4     | Student understanding of the lesson | Probability function for a discrete random variable, distribution function for a discrete random variable | Theoretical and practical | Daily and monthly tests |
| 14                   | 4     | Student understanding of the lesson | Probability function for a continuous random variable, distribution function for a                        | Theoretical and practical | Daily and monthly tests |

|                                                                                                                                                                     |   |                                     |                                                                                                  |                           |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------|-------------------------|
|                                                                                                                                                                     |   |                                     | continuous random variable                                                                       |                           |                         |
| 15                                                                                                                                                                  | 4 | Student understanding of the lesson | <b>week before the final Exam</b>                                                                | Theoretical and practical | Daily and monthly tests |
| 44. Course Evaluation                                                                                                                                               |   |                                     |                                                                                                  |                           |                         |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc |   |                                     |                                                                                                  |                           |                         |
| 45. Learning and Teaching Resources                                                                                                                                 |   |                                     |                                                                                                  |                           |                         |
| Required textbooks (curricular books, if any)                                                                                                                       |   |                                     |                                                                                                  |                           |                         |
| Main references (sources)                                                                                                                                           |   |                                     | Engineering, 1st edition: Dar Al-Fikr for Printing, Publishing and Distribution, Amman, 1999.    |                           |                         |
| Recommended books and references (scientific journals, reports...)                                                                                                  |   |                                     | Abbas Al-Asid Ibrahim, Foundations of Mathematics: Sana'a University Publications, Sana'a, 1993. |                           |                         |
| Electronic References, Websites                                                                                                                                     |   |                                     | / wp_content/net. shamsunalarabia//https: pdf .supplement_ M1M2_Lecture_0310/2018/uploads        |                           |                         |

## Principles of Probability

|                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------|
| 1. Educational Institution                                                                                              |
| Technical Administrative College - Mosul / Department of Statistics and Informatics                                     |
| 2. Course Name/Code                                                                                                     |
| Principles of Probability / SIT221                                                                                      |
| 3. Available Attendance Formats                                                                                         |
| Weekly                                                                                                                  |
| 4. Semester/Year                                                                                                        |
| First and Second / 2025-2026                                                                                            |
| 5. Number of Study Hours (Total)                                                                                        |
| 56 hours (4 hours x 14 weeks)                                                                                           |
| 6. Date this description was prepared                                                                                   |
| 2025/1/6                                                                                                                |
| 7. Course Objectives (General Course Objectives)                                                                        |
| The course aims to enable students to understand the basics of probability and probability theory and their application |

|                                                                                                                                                                                    |                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| in real life.                                                                                                                                                                      |                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 8. Course outcomes, teaching, learning and assessment methods.                                                                                                                     |                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| assessment methods                                                                                                                                                                 | teaching and learning methods                                                                                                                                                                       | Outputs                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <ul style="list-style-type: none"> <li>-Exam.</li> <li>-Solving exercises in class.</li> <li>-Asking questions to students in class.</li> <li>-Discussion and dialogue.</li> </ul> | <ul style="list-style-type: none"> <li>-1Theoretical and practical lectures.</li> <li>-2Use of educational tools (presentations and scientific films.)</li> <li>-3Practical application.</li> </ul> | <p>A- Knowledge</p> <p>A1 - The student is able to understand the basics of probability calculations</p> <p>A2 - and use probability models for some random experiments</p> <p>A3 - Enabling the student to understand how to apply the material in real life</p> <p>A4 - Includes understanding the relationship or relationships contained in the data, interpreting a relationship and its components, interpreting graphs and charts, and interpreting statistical tables.</p> |
|                                                                                                                                                                                    |                                                                                                                                                                                                     | <p>B - Skills</p> <p>B1 - Be skilled at solving probability problems</p> <p>B2 - Be skilled at identifying the type of distribution in which the data is distributed.</p> <p>B3 - Be skilled at determining the function of the data based on the shape of the distribution</p>                                                                                                                                                                                                    |
|                                                                                                                                                                                    |                                                                                                                                                                                                     | <p>C- Values</p> <p>C1- Academic and Ethical Integrity</p> <p>C2- Critical and Analytical Thinking</p> <p>C3- Teamwork and Cooperation</p> <p>C4- Commitment to Quality and Excellence</p>                                                                                                                                                                                                                                                                                         |

| 9. Course structure (theoretical and practical vocabulary) |                           |                                                                                                               |                                     |       |            |
|------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------|-------|------------|
| Evaluation method                                          | Teaching method           | Unit name/topic                                                                                               | Required learning outcomes          | hours | Week       |
| Daily and monthly tests                                    | Theoretical and practical | Set Theory                                                                                                    | Student understanding of the lesson | 4     | First      |
| Daily and monthly tests                                    | Theoretical and practical | Basic Counting Methods, Permutations                                                                          | Student understanding of the lesson | 4     | Second     |
| Daily and monthly tests                                    | Theoretical and practical | Combinations                                                                                                  | Student understanding of the lesson | 4     | Third      |
| Daily and monthly tests                                    | Theoretical and practical | Binomial Expansion Theorem                                                                                    | Student understanding of the lesson | 4     | Fourth     |
| Daily and monthly tests                                    | Theoretical and practical | Exercises                                                                                                     | Student understanding of the lesson | 4     | Fifth      |
| Daily and monthly tests                                    | Theoretical and practical | Polynomial Theorem                                                                                            | Student understanding of the lesson | 4     | Sixth      |
| Daily and monthly tests                                    | Theoretical and practical | Exams                                                                                                         | Student understanding of the lesson | 4     | Seventh    |
| Daily and monthly tests                                    | Theoretical and practical | Probability, probability concepts, random experiment, sample/event space, event probability                   | Student understanding of the lesson | 4     | Eighth     |
| Daily and monthly tests                                    | Theoretical and practical | Field and field algebra                                                                                       | Student understanding of the lesson | 4     | Ninth      |
| Daily and monthly tests                                    | Theoretical and practical | Probability axioms, conditional probability                                                                   | Student understanding of the lesson | 4     | Tenth      |
| Daily and monthly tests                                    | Theoretical and practical | Independence                                                                                                  | Student understanding of the lesson | 4     | Eleventh   |
| Daily and monthly tests                                    | Theoretical and practical | Random variables and their distributions                                                                      | Student understanding of the lesson | 4     | Twelfth    |
| Daily and monthly tests                                    | Theoretical and practical | Probability function for a discrete random variable, distribution function for a discrete random variable     | Student understanding of the lesson | 4     | Thirteenth |
| Daily and monthly tests                                    | Theoretical and practical | Probability function for a continuous random variable, distribution function for a continuous random variable | Student understanding of the lesson | 4     | Fourteenth |

|  |                           |           |  |   |           |
|--|---------------------------|-----------|--|---|-----------|
|  | Theoretical and practical | Term exam |  | 3 | Fifteenth |
|--|---------------------------|-----------|--|---|-----------|

#### 10. Curriculum development plan.

**Continuously updating the curriculum to keep pace with labor market developments (Curriculum Update Committee, Scientific Committee), such as:**

- 1. Developing curricula that are appropriate for the labor market**
- 2. Holding scientific seminars and conferences aimed at updating curricula**

**.3. Monitoring scientific developments in the field of specialization**

#### 11. . Infrastructure

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Available                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Classrooms, Laboratories, and Workshops                                  |
| Available                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1- Required Textbooks                                                    |
| Principles of Probability / Walid Al-Sayfo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2- Main References (Resources)                                           |
| Probability Theory / Amir Hanna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | a) Recommended books and references (scientific journals, reports, etc.) |
| <a href="https://www.noor-book.com/%D9%83%D8%AA%D8%A7%D8%A8-D8%A7%D9%84%D8%A7%D8%AD%D8%B5%D8%A7%D8%A1-%D9%88-D8%A7%D9%84%D8%A7%D8%AD%8%AA%D9%85%D8%A7%D9%84%D8%A7%D8%AA-D8%A7%D9%84%D9%86%D8%B8%D8%B1%D9%8A%D9%87-%D9%88-D8%A7%D9%84%D8%AA%D8%B7%D8%A8%D9%8A%D9%82-pdf">https://www.noor-book.com/%D9%83%D8%AA%D8%A7%D8%A8-D8%A7%D9%84%D8%A7%D8%AD%D8%B5%D8%A7%D8%A1-%D9%88-D8%A7%D9%84%D8%A7%D8%AD%8%AA%D9%85%D8%A7%D9%84%D8%A7%D8%AA-D8%A7%D9%84%D9%86%D8%B8%D8%B1%D9%8A%D9%87-%D9%88-D8%A7%D9%84%D8%AA%D8%B7%D8%A8%D9%8A%D9%82-pdf</a> | b) Electronic references, websites, etc.                                 |

# Sampling Theory

|                                                                                                                |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Educational Institution                                                                                     |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| Administrative Technical College - Mosul / Department of Statistics and Informatics                            |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| 2. Course Name/Code                                                                                            |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| Sampling Theory / SIT222                                                                                       |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| 3. Available Attendance Formats                                                                                |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| Weekly                                                                                                         |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| 4. Semester/Year                                                                                               |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| Second / 2025-2026                                                                                             |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| 5. Number of Study Hours (Total)                                                                               |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| 56 hours (4 hours * 14 weeks)                                                                                  |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| 6. Date of Preparation                                                                                         |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| June 1, 2025                                                                                                   |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| 7. Course Objectives (General Course Objectives)                                                               |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| The course aims to provide students with the theoretical foundation for studying samples and random sampling.  |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| 8. Course Outcomes and Teaching, Learning, and Assessment Methods                                              |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                    |
| assessment methods                                                                                             | teaching and learning methods                                                                                                             | Outputs                                                                                                                                                                                                                                                                                                                            |
| -Exam.<br>-Solving exercises in class.<br>-Asking questions to students in class.<br>-Discussion and dialogue. | -1<br>Theoretical and practical lectures.<br>-2Use of educational tools (presentations and scientific films.(<br>-3Practical application. | A- Knowledge<br>A1- Know the basic concepts of samples<br>A2- Distinguish between sample types and their characteristics<br>A3- Explain sample selection methods<br>A4- Analyze the impact of sample selection on study results                                                                                                    |
|                                                                                                                |                                                                                                                                           | B - Skills<br>B1 - Cognitive and Intellectual Skills<br>B2 - Applied and Practical Skills<br>B3 - Design a data collection plan using an appropriate sample. Select the most appropriate sampling method.<br>B4 - Use statistical analysis programs and programs such as SPSS or Excel to analyze samples and generate results ' . |
|                                                                                                                |                                                                                                                                           | C- Values                                                                                                                                                                                                                                                                                                                          |

|  |  |                                                                                                                                                        |
|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | C1- Academic and Ethical Integrity<br>C2- Critical and Analytical Thinking<br>C3- Teamwork and Cooperation<br>C4- Commitment to Quality and Excellence |
|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------|

| 9. Course structure (theoretical and practical vocabulary) |                         |                                                                                     |                                     |       |            |
|------------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------|-------|------------|
| Evaluation method                                          | Teaching method         | Unit name/topic                                                                     | Required learning outcomes          | hours | Week       |
| Theoretical and practical                                  | Daily and monthly tests | Basic Concepts and Introduction to Sampling                                         | Student understanding of the lesson | 4     | First      |
| =                                                          | =                       | Simple Random Sampling with Mean                                                    | Student understanding of the lesson | 4     | Second     |
| =                                                          | =                       | Simple Random Sampling with Total                                                   | Student understanding of the lesson | 4     | Third      |
| =                                                          | =                       | Simple Random Sampling with Proportions                                             | Student understanding of the lesson | 4     | Fourth     |
| =                                                          | =                       | Sample Estimation Methods in Simple Random Sampling                                 | Student understanding of the lesson | 4     | Fifth      |
| =                                                          | =                       | Stratified Random Sampling                                                          | Student understanding of the lesson | 4     | Sixth      |
| =                                                          | =                       | Methods of Assigning Samples to Strata                                              | Student understanding of the lesson | 4     | Seventh    |
| =                                                          | =                       | Sample estimation methods in stratified random sampling                             | Student understanding of the lesson | 4     | Eighth     |
| =                                                          | =                       | Comparison between simple and stratified random sampling with evidence and examples | Student understanding of the lesson | 4     | Ninth      |
| =                                                          | =                       | Stratified random sampling for proportions                                          | Student understanding of the lesson | 4     | Tenth      |
| =                                                          | =                       | General exercises on stratified random sampling                                     | Student understanding of the lesson | 4     | Eleventh   |
| =                                                          | =                       | Cluster and multistage sampling                                                     | Student understanding of the lesson | 4     | Twelfth    |
| =                                                          | =                       | Systematic sampling (methodology)                                                   | Student understanding of the lesson | 4     | Thirteenth |
| =                                                          | =                       | Applied sampling topics                                                             | Student understanding of the lesson | 4     | Fourteenth |
| =                                                          | =                       | Semester exam                                                                       |                                     | 3     | Fifteenth  |
|                                                            |                         |                                                                                     |                                     |       |            |

|                                                                                                                                                                                                                         |                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 10. Curriculum development plan.                                                                                                                                                                                        |                                                                          |
| Continuously updating the curriculum to keep pace with labor market developments (Curriculum Update Committee, Scientific Committee), such as:                                                                          |                                                                          |
| 1. Developing curricula that are appropriate for the labor market<br>2. Holding scientific seminars and conferences aimed at updating curricula<br>3. Monitoring scientific developments in the field of specialization |                                                                          |
| 11. . Infrastructure                                                                                                                                                                                                    |                                                                          |
|                                                                                                                                                                                                                         | <b>available classrooms, laboratories and .workshops are available</b>   |
| Random samples in scientific research, their types and methods of selection                                                                                                                                             | 1- Required textbooks                                                    |
|                                                                                                                                                                                                                         | 2- Main references (sources)                                             |
| <a href="https://drive.google.com/file/d/0B8ZAGDqoB1d3dlQ2I3VVEzbFk/view?resourcekey=0-tflJW4tVKFYyNig5O9SeuQ">https://drive.google.com/file/d/0B8ZAGDqoB1d3dlQ2I3VVEzbFk/view?resourcekey=0-tflJW4tVKFYyNig5O9SeuQ</a> | a) Recommended books and references (scientific journals, reports, etc.) |
|                                                                                                                                                                                                                         | b) Electronic references, websites, etc.                                 |

# Numerical analysis

|                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 46. Course Name:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Numerical analysis                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 47. Course Code:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| SIT227                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 48. Semester / Year:                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| First semester                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 49. Description Preparation Date:                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 1/8/2026                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 50. Available Attendance Forms:                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Weekly                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 51. Number of Credit Hours (Total) / Number of Units (Total)         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 56 hours                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 52. Course administrator's name (mention all, if more than one name) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Name: Amani Bunyan Ibrahim<br>Email: Amani_ibrahim@ntu.edu.iq        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 53. Course Objectives                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Course Objectives</b>                                             | <p>This course also aims to enable students to:</p> <p>Understand how computers work, identify sources of errors in computer calculations, and learn how to correct them. Recognize linear and nonlinear equations and learn how to solve them.</p> <p>Furthermore, study different types of matrix systems and understand arithmetic operations on matrices.</p>                                                                                                                                                                                                                                                                                                                                                                             |
| 54. Teaching and Learning Strategies                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Strategy</b>                                                      | <div style="display: flex; flex-direction: column; align-items: flex-start;"> <div>1. Active Learning</div> <div>- Encourage participation in class activities and study groups.</div> <div>2. Project-Based Learning</div> <div>- Assign practical projects in real-world contexts.</div> <div>3. Use of Technology</div> <div>- Apply educational software and interactive tools.</div> <div>4. Blended Learning</div> <div>- Provide online educational resources and short quizzes.</div> <div>5. Visual Strategies</div> <div>- Use graphs and mind maps to clarify concepts.</div> <div>6. Collaborative Learning</div> <div>- Organize joint study sessions and peer feedback.</div> <div>7. Understanding-Based Teaching</div> </div> |

|     |                                                                                                                                                                                                                                      |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | <p>- Focus on deep understanding and ask open-ended questions.</p> <p>8. Assessment Strategies</p> <p>- Use formative assessments and comprehensive final exams.</p> <p>These strategies can be adjusted based on student needs.</p> |
| 55. | Course Structure                                                                                                                                                                                                                     |

|            |   |                                     |                                                           |                           |                         |
|------------|---|-------------------------------------|-----------------------------------------------------------|---------------------------|-------------------------|
| First      | 4 | Student understanding of the lesson | Sources of errors                                         | Theoretical and practical | Daily and monthly tests |
| Second     | 4 | =                                   | Accounts using computers                                  | =                         | =                       |
| Third      | 4 | =                                   | Rolle's theory                                            | =                         | =                       |
| Fourth     | 4 | =                                   | Mean Value Theorem of Integration                         | =                         | =                       |
| Fifth      | 4 | =                                   | Teller and Cauchy theory                                  | =                         | =                       |
| VI         | 4 | =                                   | Method of bisection and pseudo position                   | =                         | =                       |
| Seventh    | 4 | =                                   | Exams                                                     | =                         | =                       |
| VIII       | 4 | =                                   | Newton Raphson's method and the cutter                    | =                         | =                       |
| Ninth      | 4 | =                                   | Fixed point and rank convergence                          | =                         | =                       |
| The tenth  | 4 | =                                   | Linear systems                                            | =                         | =                       |
| Eleventh   | 4 | =                                   | The Kaos elimination method and the Kaos-Jordan method    | =                         | =                       |
| Twelveth   | 4 | =                                   | Determinant and inverse Partial anchoring of the matrix   | =                         | =                       |
| Thirteenth | 4 | =                                   | Trigonometric analysis method                             | =                         | =                       |
| Fourteenth | 4 | =                                   | The relationship between Chaos and trigonometric analysis | =                         | =                       |
| Fifteenth  | 4 | =                                   | Chapter exam                                              | =                         | =                       |

| <b>1. Course Evaluation</b>                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Distributing the score out of 100 according to the tasks assigned to<br>the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>2. Learning and Teaching</b>                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Required textbooks (curricular)                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Main references (sources)                                                                                                                                              | Numerical analysis / Dr. Nashat Ibrahim Al-Obaidi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Recommended books and references (scientific journals / reports)                                                                                                       | Numerical analysis / Dr. Nashat Ibrahim Al-Obaidi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Electronic References, Websites                                                                                                                                        | <a href="https://www.noor-book.com/%D9%83%D8%AA%D8%A-D8%A8%D8%A7%D9%84%D8%A7%D8%A-%D8%B5%D8%A7%D8%A1-D9%88%D8%A7%D9%84%D8%A7%D8%A%D8%AA%D9%85%D8%A7%D9%-D8%A7%D8%AA^%D8%A7%D9%84%D9%86%D8%B8%D8%B1%D9%8A%D9%87%D9%88%D8%A7%D9%84%D8%AA%D8%B%D8%A8%D9%8A%D9%82-pdf%D9%">https://www.noor-book.com/%D9%83%D8%AA%D8%A-D8%A8%D8%A7%D9%84%D8%A7%D8%A-%D8%B5%D8%A7%D8%A1-D9%88%D8%A7%D9%84%D8%A7%D8%A%D8%AA%D9%85%D8%A7%D9%-D8%A7%D8%AA^%D8%A7%D9%84%D9%86%D8%B8%D8%B1%D9%8A%D9%87%D9%88%D8%A7%D9%84%D8%AA%D8%B%D8%A8%D9%8A%D9%82-pdf%D9%</a> |

## Time Series

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Educational institution:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|    | Technical Administrative College - Mosul                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 2. | Academic Department:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|    | Department of Statistics and Information Technology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 3. | Course Name/Code:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|    | Time Series/ <b>SIT225</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4. | Available attendance formats:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|    | Weekly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 5. | Semester/Year: First and Second Semesters/                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|    | 2025-2026                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 6. | Number of study hours (total):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|    | 60 hours (4 hours * 15 weeks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 7. | Date this description was prepared                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|    | : 1/9/2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 8. | Course objectives (general objectives of the course):The course aims to teach the student the general concept of time series, their types and the purpose of studying them. It also studies the most important factors affecting the behavior of the time series, and then analyzes the time series to arrive at a mathematical model that explains the relationship between the two dependent variables (y) and the independent variable (time) (t). The model is then used to determine the behavior of the series in the future. |
| 9. | Course outcomes, teaching, learning and assessment methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|    | <p><b>Course outcomes</b></p> <p><b>identification</b> Studying the relationship between the time variable and another variable that represents the phenomenon of study to know the changes that affect the phenomenon, such as (increasing and decreasing seasonal effect) and its future prediction.</p> <p><b>Its importance</b> Finding the general trend equation for the phenomenon and identifying models that follow the behavior of the phenomenon under study.</p>                                                        |

| <b>How is it determined?: Use mathematical methods and computer programs to analyze time series.</b> |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Evaluation methods                                                                                   | Teaching and learning methods                                   | Outputs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Exams and discussions                                                                                | The theoretical lectures include various mathematical problems. | <p>1- knowledge</p> <p>A1 - Studying the relationship between the time variable and a specific variable to know the changes that occur in the phenomenon from one period to another, such as the presence of (increase, decrease, stability, sharp turn, abnormal values).</p> <p>A2 - Definition of time series and components of time series.</p> <p>A3 - Identify time series models.</p> <p>A4- Time series analysis will lead to tracking the behavior of the phenomenon in the past, identifying current patterns of change, and predicting the future.</p> |
| Exams and discussions                                                                                | The theoretical lectures include various mathematical problems. | <p>B - Skills</p> <p>B1 - The student's ability to draw the original time series.</p> <p>B2 - The student's ability to identify the general trend of the time series.</p> <p>B3 - The student's ability to examine whether the time series is stationary or not.</p> <p>B4- The student arrived at a mathematical equation to find the general trend of the time series and then predict the future.</p>                                                                                                                                                          |
| Exams and discussions                                                                                | The theoretical lectures include various mathematical problems. | <p>C- Values</p> <p>A1- Solve the math problems on the board.</p> <p>A2- Asking oral questions during the lecture.</p> <p>A3- Weekly exams.</p> <p>A4- Monthly exams.</p>                                                                                                                                                                                                                                                                                                                                                                                         |

| Course structure( <b>Theoretical and practical vocabulary</b> ) .10 |                           |                                                                                                                                       |                                     |          |            |
|---------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------|------------|
| Evaluation method                                                   | Teaching method           | Unit name/topic                                                                                                                       | Required learning outcomes          | watch es | week       |
| Daily and monthly tests                                             | Theoretical and practical | Definition of time series + types + objectives + components                                                                           | Student understanding of the lesson | 4        | the first  |
| Daily and monthly tests                                             | Theoretical and practical | Time Series Analysis + Time Series Models                                                                                             | Student understanding of the lesson | 4        | the second |
| Daily and monthly tests                                             | Theoretical and practical | Methods for estimating the general trend using a chart (hand drawing method + semi-average method + moving average method)            | Student understanding of the lesson | 4        | the third  |
| Daily and monthly tests                                             | Theoretical and practical | Methods for finding the general trend using equations (1- The semi-average method)                                                    | Student understanding of the lesson | 4        | Fourth     |
| Daily and monthly tests                                             | Theoretical and practical | 2- Least squares method                                                                                                               | Student understanding of the lesson | 4        | Fifth      |
| Daily and monthly tests                                             | Theoretical and practical | Methods for changing the general trend equations (changing the base year + changing the equation from annual to monthly or quarterly) | Student understanding of the lesson | 4        | Sixth      |
| Daily and monthly tests                                             | Theoretical and practical | Predict the general trend + exclude the effect of the general trend                                                                   | Student understanding of the lesson | 4        | Seventh    |
| Daily and monthly tests                                             | Theoretical and practical | Methods for calculating seasonal changes (average method + moving average ratio method)                                               | Student understanding of the lesson | 4        | The eighth |
| Daily and monthly tests                                             | Theoretical and practical | Seasonal index forecasting + seasonal influence exclusion                                                                             | Student understanding of the lesson | 4        | Ninth      |
| Daily and monthly tests                                             | Theoretical and practical | Measuring cyclical and contingent changes                                                                                             | Student understanding of            | 4        | tenth      |

|                         |                           |                                                  |                                     |   |            |
|-------------------------|---------------------------|--------------------------------------------------|-------------------------------------|---|------------|
|                         |                           |                                                  | the lesson                          |   |            |
| Daily and monthly tests | Theoretical and practical | random changes                                   | Student understanding of the lesson | 4 | eleventh   |
| Daily and monthly tests | Theoretical and practical | Definition of general non-linear trend           | Student understanding of the lesson | 4 | twelfth    |
| Daily and monthly tests | Theoretical and practical | Second and third order curves                    | Student understanding of the lesson | 4 | thirteenth |
| Daily and monthly tests | Theoretical and practical | Semi-logarithmic equation (exponential function) | Student understanding of the lesson | 4 | fourteenth |
| Daily and monthly tests | Theoretical and practical | Time series correlation                          | Student understanding of the lesson | 4 | fifteenth  |

## 11. Curriculum Development Plan

**Continuously updating the curriculum to keep pace with developments in the labor market (Curriculum Update Committee, Scientific Committee) such as:**

Developing the curriculum based on recent editions of books and references.

## 12. infrastructure

|                                                                                                                                                                                                         |                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| <b>Available</b>                                                                                                                                                                                        | <b>Classrooms, laboratories and workshops</b>                                   |
| <b>Available</b>                                                                                                                                                                                        | <b>1- Required textbooks</b>                                                    |
| 1- Time series from the applied perspective and Box-Jenkins models / Dr. Abdul Mardi Hamid, Dr. Ahmed Hussein, Dr. Sultan bin Mohammed.<br>2- Statistical forecasting methods/ Adnan Majid Abdul Rahman | <b>2- Main References (Sources)</b>                                             |
| 1- Time series from the applied perspective and Box-Jenkins models / Dr. Abdul Mardi Hamid, Dr. Ahmed Hussein, Dr. Sultan bin Mohammed.<br>2- Statistical forecasting methods/ Adnan Majid Abdul Rahman | <b>1) Recommended books and references (scientific journals, reports, etc.)</b> |
| <a href="https://www.youtube.com/watch?v=G5k]tiDIgWM">https://www.youtube.com/watch?v=G5k]tiDIgWM</a>                                                                                                   | <b>2) Electronic references, websites,.....</b>                                 |

|                                                                                                                                                                                         |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <a href="https://www.youtube.com/watch?v=N59FAzXM2E&amp;list=PLyAeZjeZ2X_pPt6UqLjoHbxm_xYkLOp">https://www.youtube.com/watch?v=N59FAzXM2E&amp;list=PLyAeZjeZ2X_pPt6UqLjoHbxm_xYkLOp</a> |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

## SPSS Applications

|                                                                                                                                                                                                                                                      |                                                                         |                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------|
| 1. Educational Institution                                                                                                                                                                                                                           |                                                                         |                                                             |
| Technical Administrative College - Mosul / Department of Statistics and Informatics                                                                                                                                                                  |                                                                         |                                                             |
| 2. Course Name/Code                                                                                                                                                                                                                                  |                                                                         |                                                             |
| SPSS /SIT228                                                                                                                                                                                                                                         |                                                                         |                                                             |
| 3. Available Attendance Formats                                                                                                                                                                                                                      |                                                                         |                                                             |
| Weekly                                                                                                                                                                                                                                               |                                                                         |                                                             |
| 4. Semester/Year                                                                                                                                                                                                                                     |                                                                         |                                                             |
| First and Second / 2025-2026                                                                                                                                                                                                                         |                                                                         |                                                             |
| 5. Number of Study Hours (Total)                                                                                                                                                                                                                     |                                                                         |                                                             |
| 56 hours (4 hours x 14 weeks)                                                                                                                                                                                                                        |                                                                         |                                                             |
| 6. Date this description was prepared                                                                                                                                                                                                                |                                                                         |                                                             |
| 2025                                                                                                                                                                                                                                                 |                                                                         |                                                             |
| 7. Course Objectives (General Course Objectives)                                                                                                                                                                                                     |                                                                         |                                                             |
| <ul style="list-style-type: none"> <li>•Providing students with skills in using SPSS:</li> <li>•Understanding basic statistical concepts</li> <li>•Conducting descriptive statistical analysis</li> <li>•Interpreting statistical results</li> </ul> |                                                                         |                                                             |
| 8. Course outcomes, teaching, learning and assessment methods.                                                                                                                                                                                       |                                                                         |                                                             |
| assessment methods                                                                                                                                                                                                                                   | teaching and learning methods                                           | Outputs                                                     |
| - Short written tests - Assignments                                                                                                                                                                                                                  | - Practical lectures - Interactive explanations with real-life examples | 1. Determine the appropriate statistical method.            |
| - Midterm exam - Reports                                                                                                                                                                                                                             | - Demonstrations with practical applications - Discussions              | 2. Use SPSS efficiently.                                    |
| - Homework - Final exam                                                                                                                                                                                                                              | - Practical lab exercises                                               | 3. Distinguish between types of variables.                  |
| - Homework - Final exam                                                                                                                                                                                                                              | Practical lab exercises                                                 | 4. Manage and test data, and interpret statistical results. |

| 9. Course structure (theoretical and practical vocabulary)                             |                           |                                                 |                                     |       |          |
|----------------------------------------------------------------------------------------|---------------------------|-------------------------------------------------|-------------------------------------|-------|----------|
| Evaluation method                                                                      | Teaching method           | Unit name/topic                                 | Required learning outcomes          | hours | Week     |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | SPSS Program Definition                         | Student understanding of the lesson | 4     | First    |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | Program Operation and Program Screen Components | Student understanding of the lesson | 4     | Second   |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | Basic Windows and File Types                    | Student understanding of the lesson | 4     | Third    |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | Basic program dialog boxes and menus            | Student understanding of the lesson | 4     | Fourth   |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | File formatting and data operations             | Student understanding of the lesson | 4     | Fifth    |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | Data arrangement and case selection             | Student understanding of the lesson | 4     | Sixth    |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | How to select cases                             | Student understanding of the lesson | 4     | Seventh  |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | Toolbar components                              | Student understanding of the lesson | 4     | Eighth   |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | Statistical Data Analysis                       | Student understanding of the lesson | 4     | Ninth    |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | Data Graphing                                   | Student understanding of the lesson | 4     | Tenth    |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | Correlation                                     | Student understanding of the lesson | 4     | Eleventh |
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | Regression                                      | Student understanding of the lesson | 4     | Twelfth  |

|                                                                                        |                           |               |                                     |   |            |
|----------------------------------------------------------------------------------------|---------------------------|---------------|-------------------------------------|---|------------|
| Presentation, practical implementation, explanation, questions and answers, discussion | Theoretical and practical | Data analysis | Student understanding of the lesson | 4 | Thirteenth |
| test                                                                                   | Theoretical and practical |               | test                                | 4 | Fourteenth |

#### 10. Curriculum development plan.

Continuously updating the curriculum to keep pace with labor market developments (Curriculum Update Committee, Scientific Committee), such as:

1. Developing curricula that are appropriate for the labor market
2. Holding scientific seminars and conferences aimed at updating curricula
3. Monitoring scientific developments in the field of specialization

#### 11. . Infrastructure

|               |                                                                          |
|---------------|--------------------------------------------------------------------------|
| Available     | Classrooms, Laboratories, and Workshops                                  |
| Available     | 1- Required Textbooks                                                    |
| SPSS Book     | 2- Main References (Resources)                                           |
| Not Available | a) Recommended books and references (scientific journals, reports, etc.) |
| Not Available | b) Electronic references, websites, etc.                                 |

## Hypothesis Testing

|                                                                             |
|-----------------------------------------------------------------------------|
| 1. Educational institution: Technical Administrative College - Mosul        |
|                                                                             |
| 2. Academic Department: Department of Statistics and Information Technology |
|                                                                             |
| 3. Course Name/Code: Hypothesis Testing/SIT229                              |
|                                                                             |
| 4. Available attendance formats: Weekly                                     |
|                                                                             |
| 5. Semester/Year: Second Semester/2025-2026                                 |
|                                                                             |
| 6. Number of study hours (total): 60 hours (4 hours * 15 weeks)             |
|                                                                             |
| 7. Date this description was prepared: 1/7/2025                             |
|                                                                             |

| 8. Course objectives (general objectives of the course):The course aims to enable students to understand the concept of hypothesis testing using the concept of statistical inference, which begins with estimating the parameters of the study population based on a sample drawn from the population under study, in order to achieve the most important requirement, which is making appropriate decisions.                                                                                                                                                                                                                                                                                                                                                                  |                                                                 |                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9. Course outcomes, teaching, learning and assessment methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                 |                                                                                                                                                                                                            |
| <p>Enabling the student to understand the concept of hypothesis testing with the concept of statistical inference, which begins with estimating the parameters of the study community based on a sample drawn from the studied community in order to achieve the most important requirement, which is making appropriate decisions.</p> <p><b>identification:</b> a test <b>Hypotheses</b>It is a scientific method used by a researcher or student to examine an idea or prediction (hypothesis) about a particular phenomenon using data.</p> <p><b>Its importance:</b> It is widely used in scientific research, social sciences, medicine, business, cybersecurity, and more.</p> <p><b>How is it determined:</b>Helps make informed decisions based on empirical data.</p> |                                                                 |                                                                                                                                                                                                            |
| Evaluation methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Teaching and learning methods                                   | Outputs                                                                                                                                                                                                    |
| Exams and discussions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | The theoretical lectures include various mathematical problems. | 1- knowledge<br>A1 - Formulating statistical hypotheses.<br>A2 - Testing the statistical method.<br>A3 - Calculate the statistical value.<br>A4- Find the tabular values.                                  |
| Exams and discussions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | The theoretical lectures include various mathematical problems. | B - Skills<br>B1 - Tests related to a single average.<br>B2 - Tests relating the differences between two means.<br>B3 - Tests related to more than one average.<br>B4- Hypothesis tests for the population |

|                                                                     |                                                                 | proportion.                                                                                                                                                                     |                                     |          |            |
|---------------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------|------------|
| Exams and discussions                                               | The theoretical lectures include various mathematical problems. | C- Values<br>A1- Developing mental abilities.<br>A2- Developing scientific capabilities.<br>A3- Speed of response.<br>A4- Quick thinking.                                       |                                     |          |            |
| Course structure( <b>Theoretical and practical vocabulary</b> ) .10 |                                                                 |                                                                                                                                                                                 |                                     |          |            |
| Evaluation method                                                   | Teaching method                                                 | Unit name/topic                                                                                                                                                                 | Required learning outcomes          | watch es | week       |
| Daily and monthly tests                                             | Theoretical and practical                                       | Definition of hypothesis testing + the purpose of studying hypothesis testing + Statistical Hypotheses                                                                          | Student understanding of the lesson | 4        | the first  |
| Daily and monthly tests                                             | Theoretical and practical                                       | Level of Significance + Determine Acceptance and Rejection Areas + Comparison and Decision                                                                                      | Student understanding of the lesson | 4        | the second |
| Daily and monthly tests                                             | Theoretical and practical                                       | Hypothesis test for population mean $\mu$ + Hypothesis testing for means of two independent populations when the two populations are different $(\sigma_1^2, \sigma_2^2)$ known | Student understanding of the lesson | 4        | the third  |
| Daily and monthly tests                                             | Theoretical and practical                                       | Hypothesis testing for means of two independent populations when the two populations are different $(\sigma_1^2, \sigma_2^2)$ unknown                                           | Student understanding of the lesson | 4        | Fourth     |
| Daily and monthly tests                                             | Theoretical and practical                                       | Hypothesis testing if the distribution is known and the size of both samples or one of them is less than 30 observations and if the variances of the two populations are equal  | Student understanding of the lesson | 4        | Fifth      |

|                         |                           |                                                                                                                                                                                |                                     |   |            |
|-------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---|------------|
| Daily and monthly tests | Theoretical and practical | Hypothesis testing if the distribution is known and the size of both samples or one of them is less than 30 observations if the variances of the two populations are not equal | Student understanding of the lesson | 4 | Sixth      |
| Daily and monthly tests | Theoretical and practical | Hypothesis tests for population proportion                                                                                                                                     | Student understanding of the lesson | 4 | Seventh    |
| Daily and monthly tests | Theoretical and practical | Hypothesis tests for the difference between two ratios                                                                                                                         | Student understanding of the lesson | 4 | The eighth |
| Daily and monthly tests | Theoretical and practical | One-Way ANOVA                                                                                                                                                                  | Student understanding of the lesson | 4 | Ninth      |
| Daily and monthly tests | Theoretical and practical | Two-Way ANOVA                                                                                                                                                                  | Student understanding of the lesson | 4 | tenth      |
| Daily and monthly tests | Theoretical and practical | Definition of non-parametric tests and their types                                                                                                                             | Student understanding of the lesson | 4 | eleventh   |
| Daily and monthly tests | Theoretical and practical | Chi-square test ( $\chi^2$ )<br>( $\chi^2$ ) Chi-Square Test                                                                                                                   | Student understanding of the lesson | 4 | twelfth    |
| Daily and monthly tests | Theoretical and practical | The Spearman's Ranks Correlation Coefficient Test                                                                                                                              | Student understanding of the lesson | 4 | thirteenth |
| Daily and monthly tests | Theoretical and practical | The Friedman Test                                                                                                                                                              | Student understanding of the lesson | 4 | fourteenth |
| Daily and monthly tests | Theoretical and practical | The Wilcoxon Signed Ranks Test                                                                                                                                                 | Student understanding of the lesson | 4 | fifteenth  |

## 11. Curriculum Development Plan

1– Developing the curriculum based on recent editions of books and references.

## 12. infrastructure

|                  |                                               |
|------------------|-----------------------------------------------|
| <b>Available</b> | <b>Classrooms, laboratories and workshops</b> |
| <b>Available</b> | <b>1- Required textbooks</b>                  |

|                                                                                                                                                                                                                                          |                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Mathematical statistics/Amir Hormuz                                                                                                                                                                                                      | <b>2- Main References (Sources)</b>                                             |
| Mathematical statistics                                                                                                                                                                                                                  | <b>1) Recommended books and references (scientific journals, reports, etc.)</b> |
| <a href="https://www.youtube.com/watch?v=2k3e6DutCuU&amp;t=738s">https://www.youtube.com/watch?v=2k3e6DutCuU&amp;t=738s</a><br><a href="https://www.youtube.com/watch?v=tVtUeSUnDMCIQ">https://www.youtube.com/watch?v=tVtUeSUnDMCIQ</a> | <b>2) Electronic references, websites,.....</b>                                 |

## Mathematical Statistics SIT310

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                           |                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 1. Educational Institution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                                                                                                                   |
| Technical Administrative College - Mosul / Department of Statistics and Informatics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                           |                                                                                                                   |
| 2. Course Name/Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                           |                                                                                                                   |
| Mathematical Statistics SIT310                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                           |                                                                                                                   |
| 3. Available Attendance Formats                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                           |                                                                                                                   |
| Weekly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                           |                                                                                                                   |
| 4. Semester/Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                           |                                                                                                                   |
| First and Second - third class / 2025-2026                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                           |                                                                                                                   |
| 5. Number of Study Hours (Total)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                           |                                                                                                                   |
| 56 hours (4 hours x 14 weeks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                           |                                                                                                                   |
| 6. Date of Preparation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                           |                                                                                                                   |
| June 1, 2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                           |                                                                                                                   |
| 7. Course Objectives (General Objectives of the Course)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                           |                                                                                                                   |
| <ul style="list-style-type: none"> <li>•The student will practice probability density functions for continuous and discrete variables and understand their properties.</li> <li>•The student will be able to calculate probability expectation and moment-generating functions for statistical distributions.</li> <li>•The student will be able to work with probability distributions for continuous and discrete variables.</li> <li>• The student will be able to calculate the above for any statistical distribution mentioned within the curriculum</li> </ul> |                                                                           |                                                                                                                   |
| 8. Course outcomes, teaching, learning and assessment methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                           |                                                                                                                   |
| assessment methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Teaching and learning methods                                             | Outcomes                                                                                                          |
| - Short written tests - Assignments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | - Theoretical lectures - Interactive explanations with real-life examples | 1. Define the basic concepts of probability theory and random variables.                                          |
| - Midterm exam - Reports                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | - Demonstration presentations - Class                                     | 2. Distinguish between types of probability distributions and their properties (e.g., normal, Poisson, binomial). |

|                                                           |                                                                     | discussions                                                                                                                                                |                                     |       |         |
|-----------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------|---------|
| - Homework - Final exam                                   | - Practical exercises in class - Hands-on exercises using the rules | 3. Calculate the expected values, variance, and standard deviation of random variables.                                                                    |                                     |       |         |
| 9.Course structure (theoretical and practical vocabulary) |                                                                     |                                                                                                                                                            |                                     |       |         |
| Assessment Method                                         | Teaching Method                                                     | Unit/Or Topic Name                                                                                                                                         | Required Learning Outcomes          | Hours | Week    |
| Paper-based test                                          | a lecture                                                           | <ul style="list-style-type: none"><li>• Probability mass function</li><li>• Probability density function</li></ul> properties of (mass & density) function | Student understanding of the lesson | 4     | First   |
| Derive laws in collaboration with the student             | a lecture                                                           | Cumulative distribution function                                                                                                                           | Student understanding of the lesson | 4     | Second  |
| Derive laws in collaboration with the student             | a lecture                                                           | Mathematical expectation and factorial moment                                                                                                              | Student understanding of the lesson | 4     | Third   |
| Derive laws in collaboration with the student             | a lecture                                                           | Moment generation function and properties                                                                                                                  | Student understanding of the lesson | 4     | Fourth  |
| Derive laws in collaboration with the student             | a lecture                                                           | <ul style="list-style-type: none"><li>• Mean</li><li>• Median</li><li>• Mode</li></ul> Mean deviation                                                      | Student understanding of the lesson | 4     | Fifth   |
| Derive laws in collaboration with the student             | a lecture                                                           | Variance Discrete Uniform and Bernoulli distribution                                                                                                       | Student understanding of the lesson | 4     | Sixth   |
| Derive laws in collaboration with the student             | a lecture                                                           | Binomial distribution                                                                                                                                      | Student understanding of the lesson | 4     | Seventh |
| Derive laws in collaboration                              | a lecture                                                           | Poisson distribution                                                                                                                                       | Student understanding of the lesson | 4     | Eighth  |

|                                               |           |                                  |                                     |   |           |
|-----------------------------------------------|-----------|----------------------------------|-------------------------------------|---|-----------|
| with the student                              |           |                                  |                                     |   |           |
| Derive laws in collaboration with the student | a lecture | Geometric distribution           | Student understanding of the lesson | 4 | Tenth     |
| Derive laws in collaboration with the student | a lecture | Negative Binomial distribution   | Student understanding of the lesson | 4 | Eleventh  |
| Derive laws in collaboration with the student | a lecture | Hyper geometric distribution     | Student understanding of the lesson | 4 | Twelfth   |
| Derive laws in collaboration with the student | a lecture | Continuouse uniform distribution | Student understanding of the lesson | 4 | hirteenth |
| Derive laws in collaboration with the student | a lecture | Normal distribution              | Student understanding of the lesson | 4 | urteenth  |
| Derive laws in collaboration with the student | a lecture | Final Exam                       |                                     |   | Fifith    |

## 10. Curriculum development plan.

### Course Development Plan Objectives

- .1Improve learning outcomes to align with labor market requirements.
- .2Update academic content to align with recent developments in statistics and programming.
- .3Promote the use of technology and interactive methods in education.
- .4Support the practical and applied aspects of the course using software

|                                                                                                                                                                                                                       |                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| tools.                                                                                                                                                                                                                |                                                                          |
| .5Enhance the efficiency of assessments to reflect the student's actual level.                                                                                                                                        |                                                                          |
| <b>11. Infrastructure</b>                                                                                                                                                                                             |                                                                          |
| Available                                                                                                                                                                                                             | Classrooms, Laboratories, and Workshops                                  |
| Available                                                                                                                                                                                                             | 1- Required Textbooks                                                    |
| Mathematical Statistics - Amir Hanna Hormuz                                                                                                                                                                           | 2- Main References (Resources)                                           |
| Probability and Mathematical Statistics - Salah Mabkhout                                                                                                                                                              | a) Recommended books and references (scientific journals, reports, etc.) |
| <a href="https://dr-alali.com/wp-content/uploads/2020/06/%D9%85%D8%AD%D8%A7%D8%B6%D8%B1%D8%A7%D8%A9%8A-8.pdf">https://dr-alali.com/wp-content/uploads/2020/06/%D9%85%D8%AD%D8%A7%D8%B6%D8%B1%D8%A7%D8%A9%8A-8.pdf</a> | b) Electronic references, websites, etc.                                 |

## Analysis of Linear Regression

|                          |                                                                                                                                                                                                 |                               |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 56.                      | <b>Course Name:</b>                                                                                                                                                                             | Analysis of Linear Regression |
| 57.                      | <b>Course Code:</b>                                                                                                                                                                             | SIT312                        |
| 58.                      | <b>Semester / Year:</b>                                                                                                                                                                         | First semester / 2025-2026    |
| 59.                      | <b>Description Preparation Date:</b>                                                                                                                                                            | 1-9-2025                      |
| 60.                      | <b>Available Attendance Forms:</b>                                                                                                                                                              | Attendance                    |
| 61.                      | <b>Number of Credit Hours (Total) / Number of Units (Total)</b>                                                                                                                                 | 56 hours/ 3 Units             |
| 62.                      | <b>Course administrator's name (mention all, if more than one name)</b>                                                                                                                         | Dr. Adnan Mostafa Hussein     |
| 63.                      | <b>Course Objectives</b>                                                                                                                                                                        |                               |
| <b>Course Objectives</b> | The course aims to enable the student to become familiar with simple and multiple linear regression analysis, in terms of theory and application in real life as well as scientific researches. |                               |
| 64.                      | <b>Teaching and Learning Strategies</b>                                                                                                                                                         |                               |
| <b>Strategy</b>          | Theoretical lectures.<br>Practical lectures.<br>Active learning.                                                                                                                                |                               |

|  |                                                                                                                                                                                     |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Cooperative learning.<br/> Student-centered learning.<br/> Classroom discussions.<br/> Homework and practical assignments.<br/> Scientific presentations and demonstrations.</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 65. Course Structure

| Week | Hours | Required Learning Outcomes                                                           | Unit or subject name                    | Learning method | Evaluation method        |
|------|-------|--------------------------------------------------------------------------------------|-----------------------------------------|-----------------|--------------------------|
| 1    | 4     | Understand matrices and their role in regression analysis.                           | Matrices                                | Exam            | Discussion and Questions |
| 2    | 4     | Understand eigenvalues and eigenvectors and their applications.                      | Eigen Values and Vectors                |                 |                          |
| 3    | 4     | Understand the normal distribution and its statistical properties.                   | Normal Distribution and its Properties  |                 |                          |
| 4    | 4     | Explain the concept of simple linear regression.                                     | Simple Linear Regression Concept        |                 |                          |
| 5    | 4     | Estimate regression parameters using the Ordinary Least Squares (OLS) method.        | Regression Parameters Estimation by OLS |                 |                          |
| 6    | 4     | Apply OLS estimation through practical exercises.                                    | Exercises                               |                 |                          |
| 7    | 4     | Evaluate students' understanding of the first part of the course.                    | First Examination                       |                 |                          |
| 8    | 4     | Estimate regression parameters using the Maximum Likelihood Estimation (MLE) method. | Regression Parameters Estimation by MLE |                 |                          |
| 9    | 4     | Explain and evaluate the properties of regression estimators.                        | Properties of Estimators                |                 |                          |
| 10   | 4     | Understand the concept of multiple linear regression.                                | Multiple Linear Regression Concept      |                 |                          |
| 11   | 4     | Explain and verify the assumptions of the linear regression model.                   | Regression Assumptions                  |                 |                          |
| 12   | 4     | Perform hypothesis testing for regression parameters.                                | Hypothesis Testing                      |                 |                          |
| 13   | 4     | Apply analysis of variance (ANOVA) in regression models.                             | ANOVA                                   |                 |                          |
| 14   | 4     | Solve practical regression analysis problems.                                        | Exercises                               |                 |                          |
| 15   | 4     | Assess students' achievement of the course learning outcomes.                        | Final Examination                       |                 |                          |

## 3. Course Evaluation

| Type                                                               | Midterm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Final |                       |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------|
| Theory                                                             | 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 60    |                       |
| <b>4. Learning and Teaching Resources</b>                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |                       |
| Required textbooks (curricular books, if any)                      | Al-Rawi, Khasha Mahmoud (19) Introduction to Regression Analy Directorate of Books and Print University of Mosul, Iraq.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       | Inflation theory      |
| Main references (sources)                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |                       |
| Recommended books and references (scientific journals, reports...) | 1. Al-Sinjary, Adnan Mostafa. (20) Comparison of Some Estimation Methods for Multivariate Generalized Linear Mixed Models. Ph.D. Dissertat Al-Mustansiriyah University.<br>2. Dobson, A. J., & Barnett, A. (2018). "An introduction to general linear models". CRC press<br>3. Gallant, A. R. (1987). "Nonlin statistical models". John Wiley & Sons.<br>4. Gujarati, D. N. (2004). "B econometrics". 4 th Edition. McGraw–Hill Companies. USA.<br>5. Gujarati, D. (2011). "Economet by example". Macmillan. Palgr Macmillan. London. UK.<br>6. Hardin, J. W., & Hilbe, J. (2018). "Generalized linear models extensions". 4th Edition. Stata press. |       | Aggregate Equilibrium |
| Electronic References, Websites                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |                       |

## Course Description Form

|     |                               |
|-----|-------------------------------|
| 66. | Course Name: R Language       |
|     | Principles of Economics /     |
| 67. | Course Code:                  |
|     |                               |
| 68. | Semester / Year:              |
|     | First semester / 2025-2026    |
| 69. | Description Preparation Date: |
|     | 1-9-2025                      |
| 70. | Available Attendance Forms:   |

|                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Attendance                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 71. Number of Credit Hours (Total) / Number of Units (Total)             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 60 hour / 6 ECTS                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 72. Course administrator's name (mention all, if more than one name)     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Dr. Ahmad Najim Sheet Al-Shallawi<br>Email: a.n.s.al-shallawi@ntu.edu.iq |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 73. Course Objectives                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Course Objectives                                                        | <p><b>According to Bloom's Taxonomy)</b></p> <p><b>Remember</b><br/> Define the R and RStudio working environment.<br/> Identify data types and variables in R.<br/> Recall the main functions and basic commands.</p> <p><b>Understand</b><br/> Explain how R commands work.<br/> Describe importing and organizing data.<br/> Differentiate between Vectors, Matrices, Lists, and Data Frames.</p> <p><b>Apply</b><br/> Write simple R programs.<br/> Import CSV and Excel files and preprocess them.<br/> Perform descriptive statistical analysis.<br/> Create basic graphics using ggplot2.<br/> Conduct common statistical tests.</p> <p><b>Analyze</b><br/> Analyze datasets to identify patterns and relationships.<br/> Compare statistical analysis results.<br/> Debug R code.<br/> Select suitable statistical methods.</p> <p><b>Evaluate</b><br/> Evaluate data quality before analysis.<br/> Assess statistical models.<br/> Compare analysis and visualization methods.<br/> Interpret statistical findings.</p> <p><b>Create</b><br/> Develop complete R programs for statistical problems.<br/> Produce reproducible reports using R Markdown or Quarto.<br/> Create simple dashboards or Shiny applications.<br/> Complete an end-to-end data analysis project.</p> |
| 74. Teaching and Learning Strategies                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Strategy                                                                 | Lectures<br>Computer laboratory sessions<br>Hands-on learning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|  |                                                  |
|--|--------------------------------------------------|
|  | Problem-based learning<br>Project-based learning |
|--|--------------------------------------------------|

## 75. Course Structure

| Week  | Hours | Required Learning Outcomes                 | Unit or subject name        | Learning method | Evaluation method                                                                                                         |
|-------|-------|--------------------------------------------|-----------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------|
| 1     | 4     | Install R/RStudio and create first project | Introduction to R & RStudio | Lectures        | Theory examinations, practical laboratory assessments, assignments, programming exercises, and a final practical project. |
| 2     | 4     | Basic operations                           | Data types and variables    |                 |                                                                                                                           |
| 3     | 4     | Vectors, matrices, lists                   | Data structures             |                 |                                                                                                                           |
| 4     | 4     | CSV & Excel                                | Importing data              |                 |                                                                                                                           |
| 5     | 4     | Sorting and filtering                      | Basic functions             |                 |                                                                                                                           |
| 6     | 4     | Data manipulation                          | dplyr                       |                 |                                                                                                                           |
| 7     | 4     | Data visualization                         | ggplot2                     |                 |                                                                                                                           |
| 8     | 4     | Summarize and interpret                    | Descriptive statistics      |                 |                                                                                                                           |
| 9     | 4     | Basic statistical tests                    | Hypothesis testing          |                 |                                                                                                                           |
| 10    | 4     | Fit and interpret models                   | Linear regression           |                 |                                                                                                                           |
| 11    | 4     | Programming control structures             | Loops & Conditions          |                 |                                                                                                                           |
| 12    | 4     | Create reusable functions                  | Functions                   |                 |                                                                                                                           |
| 13    | 4     | Reproducible reporting                     | R Markdown / Quarto         |                 |                                                                                                                           |
| 14-15 | 4     | Complete data analysis project             | Final Project               |                 |                                                                                                                           |
| 15    | 4     | Install R/RStudio and create first project | Revision                    |                 |                                                                                                                           |

## 5. Course Evaluation

| Type   | Midterm | Final | Markets               |  |
|--------|---------|-------|-----------------------|--|
| Theory | 50      | 50    | Information economics |  |

## 6. Learning and Teaching Resources

|                                               |                                                               |
|-----------------------------------------------|---------------------------------------------------------------|
| Required textbooks (curricular books, if any) | * 1. Rami Jibril. Statistical Analysis Using R.               |
| Main references (sources)                     | 2. Mohammed Bashir Zeina. R Statistical Programming Language. |

## Nonlinear Regression Analysis

|                                            |
|--------------------------------------------|
| 1. Educational Institution                 |
| College of Administrative Technology-Mosul |
| 2. Department                              |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |                                                                |  |                                                                                                |       |      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------|--|------------------------------------------------------------------------------------------------|-------|------|
| Department of Statistics and Informatics Techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 |                                                                |  |                                                                                                |       |      |
| 3. Course Name / Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |                                                                |  |                                                                                                |       |      |
| Nonlinear Regression Analysis / SIT3120                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |                                                                |  |                                                                                                |       |      |
| 4. Attendance Forms Available                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |                                                                |  |                                                                                                |       |      |
| In-Person                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |                                                                |  |                                                                                                |       |      |
| 5. Semester / Academic Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 |                                                                |  |                                                                                                |       |      |
| Second Semester / Third Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |                                                                |  |                                                                                                |       |      |
| 6. Total Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                |  |                                                                                                |       |      |
| 3 Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |                                                                |  |                                                                                                |       |      |
| 7. Date of Preparing this Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |                                                                |  |                                                                                                |       |      |
| 2025/6/15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |                                                                |  |                                                                                                |       |      |
| 8. Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |                                                                |  |                                                                                                |       |      |
| <ul style="list-style-type: none"><li>• Enable students to distinguish between linear and nonlinear regression models.</li><li>• Develop the student’s ability to apply different types of nonlinear models to real-world data.</li><li>• Train students to transform and analyze models that cannot be linearly transformed.</li><li>• Equip students to use software tools (like R or SPSS) to implement nonlinear regression analysis.</li><li>• Enhance students’ skills in interpreting the effectiveness of nonlinear models using advanced statistical measures.</li><li>• Enable students to apply Generalized Linear Models (GLM) and logistic regression to various types of data.</li></ul> |                 |                                                                |  |                                                                                                |       |      |
| 9. Course Learning Outcomes (LOs), Teaching & Learning Methods, and Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                |  |                                                                                                |       |      |
| Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 | Teaching & Learning Methods                                    |  | Learning Outcomes (LOs)                                                                        |       |      |
| Short quizzes, theoretical questions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 | Traditional lectures, interactive discussions                  |  | Distinguish between linear and nonlinear models                                                |       |      |
| Practical exercises, evaluation projects                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 | Practical learning, case studies, group projects               |  | Apply nonlinear models to real-world data                                                      |       |      |
| Evaluation tests, analysis reports                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 | Software demonstrations, results analysis, interactive reviews |  | Analyze and assess the effectiveness of nonlinear models using advanced statistical indicators |       |      |
| Theoretical tests, evaluation projects                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 | Lectures, software applications, interactive reviews           |  | Understand generalized linear models and logistic regression for different data types          |       |      |
| 10.Course Structure (Theoretical and Practical)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |                                                                |  |                                                                                                |       |      |
| Assessment Method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Teaching Method | Unit/Topic                                                     |  | Intended Learning Outcomes                                                                     | Hours | Week |

|                                      |                        |                                             |                                               |   |    |
|--------------------------------------|------------------------|---------------------------------------------|-----------------------------------------------|---|----|
| Participation, short quiz            | Lecture                | Introduction to the course                  | Understand course objectives and content      | 3 | 1  |
| Short quiz                           | Interactive lecture    | Nonlinear Regression Models                 | Distinguish between types of nonlinear models | 3 | 2  |
| Results analysis, practical exercise | Practical lecture      | Transformable Models                        | Apply transformable models                    | 3 | 3  |
| Project, report                      | Case study             | Non-transformable Models                    | Analyze non-transformable models              | 3 | 4  |
| Evaluation test                      | Lecture and discussion | Logarithmic Models                          | Build logarithmic models                      | 3 | 5  |
| Comprehensive test                   | Interactive review     | Examples and Applications                   | Solve comprehensive nonlinear model problems  | 3 | 6  |
| Short quiz                           | Lecture                | Generalized Linear Models                   | Understand GLM distributions                  | 3 | 7  |
| Short quiz                           | Interactive lecture    | Link Functions                              | Apply link functions                          | 3 | 8  |
| Analysis, practical exercise         | Practical lecture      | Generalized Linear Models                   | Analyze GLM models using software             | 3 | 9  |
| Project, report                      | Lecture and discussion | Logistic Regression Models                  | Build logistic regression model               | 3 | 11 |
| Evaluation test                      | Lecture and discussion | Model Properties                            | Analyze model properties                      | 3 | 12 |
| Comprehensive test                   | Interactive review     | Parameter Estimation                        | Estimate model parameters                     | 3 | 13 |
| Short quiz                           | Lecture                | Classification Tables and Accuracy Measures | Analyze classification tables                 | 3 | 14 |
| Final exam, project                  | Comprehensive review   | Final Review and Applications               | Final review and practical application        | 3 | 15 |

## 11. Course Development Plan

### Objectives of the Development Plan:

1. Align the course with modern statistical applications in different sectors.
2. Strengthen the practical side by including case studies and real data sets.
3. Expand the use of statistical software in practical training.

|                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| 4. Improve the diversity of assessment methods (practical tasks, reports, discussions, projects).<br>5. Connect course content with market requirements for statistical data analysts.<br>6. Support ethical practices when working with data and interpreting results.<br>7. Update references to include the latest research and modern applications. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>12. Infrastructure</b>                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Classrooms, Laboratories, Workshops</b>                                                                                                                                                                                                                                                                                                              | <b>Available</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Required Textbooks</b>                                                                                                                                                                                                                                                                                                                               | Al-Rawi, Khasha Mahmoud (1987). Introduction to Regression Analysis. Directorate of Books and Printing, University of Mosul, Iraq.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Main References (Sources)</b>                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Recommended Books and References</b>                                                                                                                                                                                                                                                                                                                 | 1. Al-Sinjary, Adnan Mostafa. (2022). Comparison of Some Estimation Methods for Multivariate Generalized Linear Mixed Models. Ph.D. Dissertation, Al-Mustansiriyah University.<br>2. Dobson, A. J., & Barnett, A. G. (2018). "An introduction to generalized linear models". CRC press<br>3. Gallant, A. R. (1987). "Nonlinear statistical models". John Wiley & Sons.<br>4. Gujarati, D. N. (2004). "Basic econometrics4". 4th Edition. The McGraw–Hill Companies. USA.<br>5. Gujarati, D. (2011). "Econometrics by example". Macmillan .Palgrave Macmillan. London. UK.<br>6. Hardin, J. W., & Hilbe, J. M. (2018). "Generalized linear models and extensions". 4th Edition. Stata press . |
| <b>Electronic References, Websites, etc.</b>                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Computer Application (R Language)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                   |                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------|
| 13. Educational Institution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                   |                                                   |
| College of Administrative Technology-Mosul                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                   |                                                   |
| 14. Department                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                   |                                                   |
| Department of Statistics and Informatics Techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                   |                                                   |
| 15. Course Name / Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                   |                                                   |
| Computer Application (R Language) / SIT3121                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                   |                                                   |
| 16. Attendance Forms Available                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                   |                                                   |
| In-Person                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                   |                                                   |
| 17. Semester / Academic Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                   |                                                   |
| Second Semester / Third Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                   |                                                   |
| 18. Total Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                   |                                                   |
| 3 Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                   |                                                   |
| 19. Date of Preparing this Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                   |                                                   |
| 2025/6/15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                   |                                                   |
| 20. Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                   |                                                   |
| <ul style="list-style-type: none"> <li>Master the R environment and its fundamental tools for data handling and statistical computing.</li> <li>Enable students to import, clean, and process real datasets.</li> <li>Train students to write equations, custom functions, loops, and conditional structures in R.</li> <li>Develop the student's ability to apply R in real-world analytical tasks and generate visualizations.</li> <li>Strengthen skills in interpreting analytical results and delivering programming solutions effectively.</li> <li>Equip students to design and implement small analytical projects using R.</li> </ul> |                                                                   |                                                   |
| 21. Course Learning Outcomes (LOs), Teaching & Learning Methods, and Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                   |                                                   |
| Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Teaching & Learning Methods                                       | Learning Outcomes (LOs)                           |
| Short quizzes, practical exercises, mini project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Introductory lectures, practical learning, real data case studies | Master the R environment, import and process data |
| Programming exercises, analysis reports, code evaluation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Interactive lectures, coding workshops, group projects            | Write custom equations and functions in R         |

|                                                     |                                                                       |                                                                                       |                                          |       |      |
|-----------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------|-------|------|
| Evaluation tests, coding project, oral presentation | Lectures, problem-based learning (PBL), practical application using R | Use loops and if/else conditions for advanced analytical tasks                        |                                          |       |      |
| Final project, presentation, peer assessment        | Applied projects, collaborative learning, guidance sessions           | Apply R to real-world analytical projects and deliver effective programming solutions |                                          |       |      |
| 22.Course Structure (Theoretical and Practical)     |                                                                       |                                                                                       |                                          |       |      |
| Assessment Method                                   | Teaching Method                                                       | Unit/Topic                                                                            | Intended Learning Outcomes               | Hours | Week |
| Participation, simple exercise                      | Lecture, practical application                                        | Introduction to R and RStudio                                                         | Understand R environment and basics      | 3     | 1    |
| Practical exercises                                 | Practical application, live examples                                  | Reading and processing data                                                           | Import and clean data with R             | 3     | 2    |
| Short quiz                                          | Lecture, direct coding                                                | Mean, standard deviation, variance                                                    | Calculate basic statistical indicators   | 3     | 3    |
| Code analysis, practical exercise                   | Lecture, workshop                                                     | Functions & Loops                                                                     | Create functions and use loops           | 3     | 4    |
| Short quiz                                          | Practical application, conditional scenarios                          | if/else structures                                                                    | Use if/else conditions                   | 3     | 5    |
| Analytical report                                   | Interactive explanation, data application                             | Bar and pie charts                                                                    | Graphical and visual analysis            | 3     | 6    |
| Practical test, report                              | Lecture, practical application                                        | ggplot2 basics                                                                        | Graphing with ggplot2                    | 3     | 7    |
| Applied test                                        | Explanation + direct coding                                           | cor, lm, summary                                                                      | Correlation and regression analysis      | 3     | 8    |
| Practical exercises                                 | Lecture, practical exercise                                           | apply family                                                                          | Programming with apply/sapply            | 3     | 9    |
| Case analysis, short quiz                           | Workshop, real cases                                                  | stringr, substr                                                                       | Handle text and string data              | 3     | 10   |
| Data report                                         | Practical application, analytical case                                | filter, select, mutate                                                                | Organize and transform tables with dplyr | 3     | 11   |
| Evaluation exercises                                | Practical discussion, multiple examples                               | Data preprocessing                                                                    | Prepare and verify modeling data         | 3     | 12   |
| Mini project                                        | Analytical explanation, direct implementation                         | Modeling using lm                                                                     | Build a simple statistical model         | 3     | 13   |

|              |                                         |                             |                                        |   |    |
|--------------|-----------------------------------------|-----------------------------|----------------------------------------|---|----|
| Final report | Interactive review<br>interpretive code | Goodness of fit and testing | Analyze and interpret<br>model results | 3 | 14 |
|--------------|-----------------------------------------|-----------------------------|----------------------------------------|---|----|

|                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>23. Course Development Plan</b>                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Objectives of the Development Plan:                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 8. Align course outcomes with current market demands for data analysts and programmers.         |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 9. Enhance practical sessions with real-world cases and diverse data sources.                   |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 10. Integrate modern tools such as RStudio and relevant libraries like ggplot2, dplyr, stringr. |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 11. Improve the balance between theory, coding practice, and result interpretation.             |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 12. Diversify assessment tools to include coding exercises, peer reviews, and mini-projects.    |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 13. Encourage collaborative learning and project-based teamwork.                                |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 14. Promote academic honesty and responsible data handling.                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 15. Update reading materials with the latest books and online resources.                        |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>24. Infrastructure</b>                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Classrooms, Laboratories, Workshops</b>                                                      | <b>Available</b>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required Textbooks</b>                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Main References (Sources)</b>                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Recommended Books and References</b>                                                         | 1. James, G., Witten, D., Hastie, T., & Tibshirani, R., (2013), “ <b>An introduction to statistical learning</b> ”, New York: springer.<br>2. Pathak, M. A., (2014), “ <b>Beginning data science with R</b> ”, Springer.<br>3. Pearson, R. K., (2018), “ <b>Exploratory data analysis using R</b> ”, CRC Press.<br>4. Tattar, P. N., Ramaiah, S., & Manjunath, B. G., (2016), “ <b>A Course in Statistics with R</b> ”, John Wiley & Sons. |
| <b>Electronic References, Websites, etc.</b>                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                            |

### **Course Description Form** Biostatistics

|    |                                                                   |
|----|-------------------------------------------------------------------|
| 1. | Educational institution: Technical Administrative College - Mosul |
|    |                                                                   |
| 2. | Academic Department: Department of Statistics and Informati       |

|                                                                                                                                                                                                                                                                                                                                                                                    |                               |         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------|
| Technology                                                                                                                                                                                                                                                                                                                                                                         |                               |         |
|                                                                                                                                                                                                                                                                                                                                                                                    |                               |         |
| 3. Course Name/Code: Biostatistics/ SIT314                                                                                                                                                                                                                                                                                                                                         |                               |         |
|                                                                                                                                                                                                                                                                                                                                                                                    |                               |         |
| 4. Available attendance formats: Weekly                                                                                                                                                                                                                                                                                                                                            |                               |         |
|                                                                                                                                                                                                                                                                                                                                                                                    |                               |         |
| 5. Semester/Year: First and Second Semesters/2025-2026                                                                                                                                                                                                                                                                                                                             |                               |         |
|                                                                                                                                                                                                                                                                                                                                                                                    |                               |         |
| 6. Number of study hours (total): 60 hours (4 hours * 15 weeks)                                                                                                                                                                                                                                                                                                                    |                               |         |
|                                                                                                                                                                                                                                                                                                                                                                                    |                               |         |
| 7. Date this description was prepared: 1/7/2025                                                                                                                                                                                                                                                                                                                                    |                               |         |
|                                                                                                                                                                                                                                                                                                                                                                                    |                               |         |
| 8. Course objectives (general objectives of the course):The course aims to enable the student to identify health statistics that show the general health status in the country by studying the most important statistical measures used in vital statistics, which include: (death statistics, birth statistics, fertility statistics, and other health and population statistics) |                               |         |
|                                                                                                                                                                                                                                                                                                                                                                                    |                               |         |
| 9. Course outcomes, teaching, learning and assessment methods                                                                                                                                                                                                                                                                                                                      |                               |         |
| <b>Course outcomes</b>                                                                                                                                                                                                                                                                                                                                                             |                               |         |
| <b>identification:</b> Biostatistics is a branch of statistics that deals with the application of statistical methods to biological, medical, and health data. It is primarily used in the design of clinical studies, the analysis of research results, and the interpretation of data related to public health and biomedicine.                                                  |                               |         |
| <b>Its importance</b> Biostatistics is a crucial tool in analyzing health and medical data, helping researchers and decision makers make accurate, evidence-based decisions.                                                                                                                                                                                                       |                               |         |
| How is it determined?Biostatistics is defined as an applied science used when biological or medical data are analyzed to make accurate scientific decisions in health and research.                                                                                                                                                                                                |                               |         |
| Evaluation methods                                                                                                                                                                                                                                                                                                                                                                 | Teaching and learning methods | Outputs |

|                                  |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Solve math problems on the board | The theoretical lectures include various mathematical problems. | 1- knowledge<br>A1 - Planning in the educational, health, economic and social fields.<br>A2 - Organizing and improving public and private services.<br>A3 - Measuring the scientific and cultural level of society.<br>A4- Local and international comparisons.                                                                                                                                                                                                                                                                             |
| Solve math problems on the board | The theoretical lectures include various mathematical problems. | B - Skills<br>B1 - The student's ability to find mortality statistics that include (crude death rate, infant mortality, stillbirth rate).<br>B2 - The student's ability to find fertility statistics that include (general fertility rate, fertility rate by age groups)<br>B3 - The student's ability to find disease statistics that include (the incidence rate of a certain disease, the prevalence rate of the disease, and the mortality rate).<br>B4- Finding the relative risk, testing the compatibility between two laboratories. |
| Solve math problems on the board | The theoretical lectures include various mathematical problems. | C- Values<br>A1- Developing mental abilities.<br>A2- Quick thinking.<br>A3- Developing scientific capabilities.<br>A4- Speed of response.                                                                                                                                                                                                                                                                                                                                                                                                   |

Course structure **(Theoretical and practical vocabulary)** .10

| Evaluation method       | Teaching method           | Unit name/topic                                                                                        | Required learning outcomes          | watch es | week      |
|-------------------------|---------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------|----------|-----------|
| Daily and monthly tests | Theoretical and practical | Correlations include (Pearson's correlation coefficient, Spearman's correlation, pairing, concordance) | Student understanding of the lesson | 4        | the first |
| Daily and monthly tests | Theoretical and practical | Death statistics                                                                                       | Student understanding of the lesson | 4        | the secon |

|                                 |                           |                                                                                             |                                     |   |            |
|---------------------------------|---------------------------|---------------------------------------------------------------------------------------------|-------------------------------------|---|------------|
|                                 |                           |                                                                                             |                                     |   | d          |
| Daily and monthly tests         | Theoretical and practical | Fertility statistics                                                                        | Student understanding of the lesson | 4 | the third  |
| Daily and monthly tests         | Theoretical and practical | Disease statistics                                                                          | Student understanding of the lesson | 4 | Fourth     |
| Daily and monthly tests         | Theoretical and practical | Definition of life tables                                                                   | Student understanding of the lesson | 4 | Fifth      |
| Daily and monthly tests         | Theoretical and practical | Regular life schedules                                                                      | Student understanding of the lesson | 4 | Sixth      |
| Daily and monthly tests         | Theoretical and practical | Clinical life tables                                                                        | Student understanding of the lesson | 4 | Seventh    |
| Daily and monthly tests         | Theoretical and practical | Tests related to standard deviation and variance                                            | Student understanding of the lesson | 4 | The eighth |
| Daily and monthly tests         | Theoretical and practical | Test of homogeneity of variances between two independent estimates                          | Student understanding of the lesson | 4 | Ninth      |
| Daily and monthly tests         | Theoretical and practical | Test of equality of several variances                                                       | Student understanding of the lesson | 4 | tenth      |
| Daily and monthly tests         | Theoretical and practical | Use of the test $\chi^2$<br>$\chi^2$ Chi-square test to compare two rates (goodness of fit) | Student understanding of the lesson | 4 | eleventh   |
| Daily and monthly tests         | Theoretical and practical | Measures of the relationship between life factors                                           | Student understanding of the lesson | 4 | twelfth    |
| Daily and monthly tests         | Theoretical and practical | Significance of difference between rates (comparison between several rates)                 | Student understanding of the lesson | 4 | thirteenth |
| Daily and monthly tests         | Theoretical and practical | relative risk                                                                               | Student understanding of the lesson | 4 | fourteenth |
| Daily and monthly tests         | Theoretical and practical | Laboratory tests                                                                            | Student understanding of the lesson | 4 | fifteenth  |
| 11. Curriculum Development Plan |                           |                                                                                             |                                     |   |            |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 1- Developing the curriculum based on recent editions of books and references.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                          |
| 12. infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                          |
| <b>Available</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Classrooms, laboratories and workshops</b>                            |
| <b>Available</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>1- Required textbooks</b>                                             |
| <b>Principles of Vital Statistics, L Tables, Population Census</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>2- Main References (Sources)</b>                                      |
| 1-Biostatistics/Imad Touma.<br>2- Biostatistics using SPSS/Assistant Professor Jassim Mohammed Ali, and Professor Dr. Wissam Malik Daoud.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1) Recommended books and references (scientific journals, reports, etc.) |
| <a href="https://www.youtube.com/watch?v=fto9Z-sRNwo&amp;list=PLykWDuh5NXEbEfZTLpe9aXLPKRuf8B6i0">https://www.youtube.com/watch?v=fto9Z-sRNwo&amp;list=PLykWDuh5NXEbEfZTLpe9aXLPKRuf8B6i0</a><br><a href="https://www.youtube.com/watch?v=MHXHgPPB0CI">https://www.youtube.com/watch?v=MHXHgPPB0CI</a><br><a href="https://www.google.iq/books/edition/%D8%A7%D9%84%D8%A5%D8%AD%D8%B5%D8%A7%D8%A1%D8%A7%D9%84%D8%AD%D9%8A%D9%88%D9%8A%D8%A8%D8%A5%D8%B3%D8%AA%D8%AE%D8%AF/dVFmDwAAQBAJ?hl=en&amp;gbpv=1&amp;dq=%D8%A7%D9%84%D8%A7%D8%AD%D8%B5%D8%A7%D8%A1+%D8%A7%D9%84%D8%AD%D9%8A%D9%88%D9%8A&amp;printsec=frontcover">https://www.google.iq/books/edition/%D8%A7%D9%84%D8%A5%D8%AD%D8%B5%D8%A7%D8%A1%D8%A7%D9%84%D8%AD%D9%8A%D9%88%D9%8A%D8%A8%D8%A5%D8%B3%D8%AA%D8%AE%D8%AF/dVFmDwAAQBAJ?hl=en&amp;gbpv=1&amp;dq=%D8%A7%D9%84%D8%A7%D8%AD%D8%B5%D8%A7%D8%A1+%D8%A7%D9%84%D8%AD%D9%8A%D9%88%D9%8A&amp;printsec=frontcover</a><br><a href="https://www.google.iq/books/edition/tal and Health Statistics/eQlOrH6Wsu?hl=ar&amp;gbpv=1&amp;dq=Vital+and+demographic+statistics&amp;printsec=frontcover">https://www.google.iq/books/edition/tal and Health Statistics/eQlOrH6Wsu?hl=ar&amp;gbpv=1&amp;dq=Vital+and+demographic+statistics&amp;printsec=frontcover</a> | 2) Electronic references, websites,.....                                 |

## Operations Research

|                                                                     |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|---------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 76.                                                                 | <b>Course Name:</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|                                                                     |                                                                         | Operations Research (for the first stage)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| 77.                                                                 | <b>Course Code:</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|                                                                     |                                                                         | SIT301                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| 78.                                                                 | <b>Semester / Year:</b>                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|                                                                     |                                                                         | First semester / 2026-2027                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| 79.                                                                 | <b>Description Preparation Date:</b>                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|                                                                     |                                                                         | 18-7-2026                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| <b>80. Available Attendance Forms:</b>                              |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
| Attendance                                                          |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
| <b>81. Number of Credit Hours (Total) / Number of Units (Total)</b> |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
| 60 hour / 4 units                                                   |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
| 82.                                                                 | <b>Course administrator's name (mention all, if more than one name)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|                                                                     | Ayad Abdulaziz Mahmood<br>ayad_alhamdani@ntu.edu.iq                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
| 83.                                                                 | <b>Course Objectives</b>                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|                                                                     | <b>Course Objectives</b>                                                | <p>Operations research aims to support management in making accurate and complex decisions using mathematical models and quantitative methods. These studies seek to improve the efficiency of allocating limited resources, reduce costs, maximize profits, and minimize reliance on intuition and personal guesswork. The objectives of operations research can be broadly categorized into the following key areas:</p> <ol style="list-style-type: none"> <li>1- Supporting decision-making</li> <li>2- Optimizing resource utilization</li> <li>3- Reducing risks and costs</li> <li>4- Solving complex problems</li> <li>5- Improving system performance</li> </ol> |  |
| 84.                                                                 | <b>Teaching and Learning Strategies</b>                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|                                                                     | <b>Strategy</b>                                                         | <ol style="list-style-type: none"> <li>1. Explaining scientific material through theoretical lectures</li> <li>2. Discussions and simplified explanations</li> <li>3. Brainstorming techniques</li> <li>4. Questioning and group discussion</li> <li>5. Analyzing real-life situations and how to respond to them as homework assignments</li> </ol>                                                                                                                                                                                                                                                                                                                      |  |
| <b>85. Course Structure</b>                                         |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |

| Week                               | Hours   | Required Learning Outcomes                                                                                                                                   | Unit or subject name                                                                                                      | Learning method                           | Evaluation method                    |
|------------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------|
| 1                                  | 4 hours | Finding solutions to inequalities with one or two variables.                                                                                                 | Solving linear inequalities with one or two variables                                                                     | Lecture With presentation and explanation | Questions and Answers and Discussion |
| 2                                  | 4 hours | Finding solutions to systems of linear inequalities with one, two, or more variables.                                                                        | The common solution that satisfies a system of linear inequalities with one variable, two variables, or several variables |                                           |                                      |
| 3                                  | 4 hours | Defining a convex set and finding the region of common solutions for linear inequalities.                                                                    | The convex set and the solution region of a system of linear inequalities                                                 |                                           |                                      |
| 4                                  | 4 hours | Finding the solution set for a system of linear equations                                                                                                    | Linear equations where the number of equations, m, equals the number of variables, n (case n=m).                          |                                           |                                      |
| 5                                  | 4 hours | Finding basic solutions to linear equations where the number of equations m is less than the number of variables n                                           | Basic solutions                                                                                                           |                                           |                                      |
| 6                                  | 4 hours | Finding basic solutions to a system of linear equations where $n > m$                                                                                        | Jordan-Gauss method for solving linear equations where $n > m$                                                            |                                           |                                      |
| 7                                  | 4 hours | Finding the basic non-negative solutions and using the simplex method to find the basic non-negative solutions of a system of linear equations where $n > m$ | Basic non-negative solutions and the simplex method for a system of linear equations where $n > m$                        |                                           |                                      |
| 8                                  | 4 hours | First exam of the first semester                                                                                                                             |                                                                                                                           |                                           |                                      |
| 9                                  | 4 hours | Knowing how to formulate a mathematical model                                                                                                                | Principles of Linear Programming                                                                                          |                                           |                                      |
| 10                                 | 4 hours | Understanding how to formulate a general model for linear programming problems and how to formulate the systematic model for linear programming problems     | Linear models and their forms in linear programming                                                                       |                                           |                                      |
| 11                                 | 4 hours | Finding solutions to linear programming problems using the graphical method                                                                                  | The graphical method for finding the optimal solution for linear models                                                   |                                           |                                      |
| 12                                 | 4 hours | Finding the optimal solution to a linear programming problem using the modified simplex algorithm                                                            | Modified Simplex Algorithm                                                                                                |                                           |                                      |
| 13                                 | 4 hours | Finding the ideal solution using the method of Major Fines M                                                                                                 | The synthetic base simplex algorithm (or the large fines method)                                                          |                                           |                                      |
| 14                                 | 4 hours | Understanding how to form dual models and how to find optimal solutions for dual models                                                                      | Duals models                                                                                                              |                                           |                                      |
| 15                                 | 4 hours | Second exam for the first semester                                                                                                                           | —                                                                                                                         |                                           |                                      |
| 7. Course Evaluation               |         |                                                                                                                                                              |                                                                                                                           |                                           |                                      |
| Type                               | Midterm | Final                                                                                                                                                        | Total                                                                                                                     |                                           |                                      |
| Theory                             | 50      | 50                                                                                                                                                           | 100                                                                                                                       |                                           |                                      |
| 8. Learning and Teaching Resources |         |                                                                                                                                                              |                                                                                                                           |                                           |                                      |

|                                                                       |                                                                      |
|-----------------------------------------------------------------------|----------------------------------------------------------------------|
| Required textbooks (curricular books, if any)                         | Introduction to Operations Research..<br>Dr. Ibrahim Mohammed Al-Ali |
| Main references (sources)                                             |                                                                      |
| Recommended books and references<br>(scientific journals, reports...) |                                                                      |
| Electronic References, Websites                                       |                                                                      |

## Queuing theory

|                                                                                                                                                                                                                                                                                           |                                  |          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------|
| 1. Educational Institution                                                                                                                                                                                                                                                                |                                  |          |
| Technical Administrative College - Mosul /                                                                                                                                                                                                                                                |                                  |          |
| 2. Department                                                                                                                                                                                                                                                                             |                                  |          |
| Department of Statistics and Informatics                                                                                                                                                                                                                                                  |                                  |          |
| 3.. Course Name/Code                                                                                                                                                                                                                                                                      |                                  |          |
| Queuing theory/ SIT315                                                                                                                                                                                                                                                                    |                                  |          |
| 4. Available Attendance Formats                                                                                                                                                                                                                                                           |                                  |          |
| Weekly                                                                                                                                                                                                                                                                                    |                                  |          |
| 5.. Semester/Year                                                                                                                                                                                                                                                                         |                                  |          |
| First / Theird class                                                                                                                                                                                                                                                                      |                                  |          |
| 6.. Number of Study Hours (Total)                                                                                                                                                                                                                                                         |                                  |          |
| 56 hours (4 hours x 14 weeks)                                                                                                                                                                                                                                                             |                                  |          |
| 7.. Date of Preparation                                                                                                                                                                                                                                                                   |                                  |          |
| 2025                                                                                                                                                                                                                                                                                      |                                  |          |
| 8.. Course Objectives (General Objectives of the Course)                                                                                                                                                                                                                                  |                                  |          |
| The primary goal of queuing theory is to analyze and optimize queuing systems to increase efficiency and reduce costs. Queuing theory studies the behavior and flow of customers in queues and provides mathematical tools for analyzing and predicting the performance of these systems. |                                  |          |
| 9. Course outcomes, teaching, learning and assessment methods                                                                                                                                                                                                                             |                                  |          |
| assessment methods                                                                                                                                                                                                                                                                        | Teaching and learning<br>methods | Outcomes |

|                                        |                                                                                 |                                                                                                                                                                                                                                                                                                       |
|----------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| - Short written tests -<br>Assignments | - Theoretical lectures -<br>Interactive explanations<br>with real-life examples | Key performance indicators are:<br>Average waiting time in line<br>Average time spent in the system<br>Average number of customers in line<br>Average number of customers in the system                                                                                                               |
| - Midterm exam -<br>Reports            | - Demonstration<br>presentations - Class<br>discussions                         | Resource Optimization and Planning<br>Determine the optimal number of servers to reduce<br>wait times while maintaining efficiency.<br>Optimize resource allocation across multiple service<br>stations.<br>Analysis of the impact of increased demand or<br>reduced staffing on system performance.. |
| - Homework - Final<br>exam             | - Practical exercises in<br>class - Hands-on<br>exercises using the<br>rules    | Capacity Analysis<br>Knowing the maximum number of customers that can<br>be accommodated before service quality deteriorates.<br>Determining the saturation point at which the<br>system becomes inefficient.                                                                                         |

## 9. Course outcomes, teaching, learning and assessment methods

| assessment<br>methods         | Teaching and<br>learning<br>methods | Outcomes                                                 | assessment methods                  | Teaching<br>and<br>learning<br>methods | Outcomes |
|-------------------------------|-------------------------------------|----------------------------------------------------------|-------------------------------------|----------------------------------------|----------|
| Daily and<br>monthly<br>tests | oretical and<br>practical           | roduction to Queuing Theory                              | dent understanding<br>of the lesson | 4                                      | First    |
| Daily and<br>monthly<br>tests | oretical and<br>practical           | es of Homogeneous and<br>erogeneous Poisson<br>Processes | dent understanding of<br>the lesson | 4                                      | Second   |
| Daily and<br>monthly<br>tests | oretical and<br>practical           | Queuing Theory                                           | dent understanding of<br>the lesson | 4                                      | Third    |
| Daily and<br>monthly<br>tests | oretical and<br>practical           | Elements and<br>racteristics of Queuing<br>Models        | dent understanding of<br>the lesson | 4                                      | Fourth   |
| Daily and<br>monthly<br>tests | oretical and<br>practical           | Service Distribution                                     | dent understanding of<br>the lesson | 4                                      | Fifth    |
| Daily and<br>monthly<br>tests | oretical and<br>practical           | hs, Deaths, and Some<br>Waiting Line Models              | dent understanding of<br>the lesson | 4                                      | Sixth    |
| Daily and<br>monthly<br>tests | oretical and<br>practical           | Waiting Line Models                                      | dent understanding of<br>the lesson | 4                                      | Seventh  |
| Daily and<br>monthly<br>tests | oretical and<br>practical           | iting Lines in Public Services                           | dent understanding of<br>the lesson | 4                                      | Eighth   |
| Daily and<br>monthly          | oretical and<br>practical           | Service Rules and Forms                                  | dent understanding of<br>the lesson | 4                                      | Ninth    |

|                         |                        |                                              |                                     |   |            |
|-------------------------|------------------------|----------------------------------------------|-------------------------------------|---|------------|
| tests                   |                        |                                              |                                     |   |            |
| Daily and monthly tests | oretical and practical | Waiting Lines                                | Student understanding of the lesson | 4 | Tenth      |
| Daily and monthly tests | oretical and practical | Customer Behavior                            | ent understanding of the lesson     | 4 | Eleventh   |
| Daily and monthly tests | oretical and practical | rk Analysis in a Specific System             | ent understanding of the lesson     | 4 | Twelfth    |
| Daily and monthly tests | oretical and practical | -line service system, one service center     | ent understanding of the lesson     | 4 | Thirteenth |
| Daily and monthly tests | oretical and practical | ting lines as a random context for the model | ent understanding of the lesson     | 4 | Fourteenth |
|                         |                        |                                              | Fanal Exam                          |   | Fifth      |

### 11. Curriculum development plan.

Continuously updating the curriculum to keep pace with labor market developments (Curriculum Update Committee, Scientific Committee), such as:

1. .Developing curricula that are appropriate for the labor market
2. Holding scientific seminars and conferences aimed at updating curricula
3. Monitoring scientific developments in the field of specialization

### 12. Infrastructure

|                                                                                                       |                                                                          |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Available                                                                                             | Classrooms, Laboratories, and Workshops                                  |
| Available                                                                                             | 1- Required Textbooks                                                    |
| Introduction to Operations Research<br>Dr. Ibrahim Mohammed Al-Ali                                    | 2- Main References (Resources)                                           |
| Queue Theory / Sameh Mohamed                                                                          | a) Recommended books and references (scientific journals, reports, etc.) |
| <a href="https://www.youtube.com/watch?v=7meshy6zRkU">https://www.youtube.com/watch?v=7meshy6zRkU</a> | b) Electronic references, websites, etc.                                 |

## Nonparametric Methods

|                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                             |                                                                                                                                  |                                         |              |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------|-------------|
| <b>25. Educational Institution</b>                                                                                                                                                                                                                                                                                                                                                                                          |                                                             |                                                                                                                                  |                                         |              |             |
| College of Administrative Technology-Mosul                                                                                                                                                                                                                                                                                                                                                                                  |                                                             |                                                                                                                                  |                                         |              |             |
| <b>26. Department</b>                                                                                                                                                                                                                                                                                                                                                                                                       |                                                             |                                                                                                                                  |                                         |              |             |
| Department of Statistics and Informatics Techniques                                                                                                                                                                                                                                                                                                                                                                         |                                                             |                                                                                                                                  |                                         |              |             |
| <b>27. Course Name / Code</b>                                                                                                                                                                                                                                                                                                                                                                                               |                                                             |                                                                                                                                  |                                         |              |             |
| Nonparametric Methods / SIT414                                                                                                                                                                                                                                                                                                                                                                                              |                                                             |                                                                                                                                  |                                         |              |             |
| <b>28. Attendance Forms Available</b>                                                                                                                                                                                                                                                                                                                                                                                       |                                                             |                                                                                                                                  |                                         |              |             |
| In-Person                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                             |                                                                                                                                  |                                         |              |             |
| <b>29. Semester / Academic Year</b>                                                                                                                                                                                                                                                                                                                                                                                         |                                                             |                                                                                                                                  |                                         |              |             |
| First Semester / Fourth Year                                                                                                                                                                                                                                                                                                                                                                                                |                                                             |                                                                                                                                  |                                         |              |             |
| <b>30. Total Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                      |                                                             |                                                                                                                                  |                                         |              |             |
| 3 Hours                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                             |                                                                                                                                  |                                         |              |             |
| <b>31. Date of Preparing this Description</b>                                                                                                                                                                                                                                                                                                                                                                               |                                                             |                                                                                                                                  |                                         |              |             |
| 2025/6/15                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                             |                                                                                                                                  |                                         |              |             |
| <b>32. Course Objectives</b>                                                                                                                                                                                                                                                                                                                                                                                                |                                                             |                                                                                                                                  |                                         |              |             |
| <ul style="list-style-type: none"> <li>Enable students to understand and apply nonparametric tests in data analysis.</li> <li>Develop the ability to select the appropriate test based on data characteristics.</li> <li>Enhance students' skills in analyzing and interpreting nonparametric statistical results.</li> <li>Train students to use statistical software to apply and analyze nonparametric tests.</li> </ul> |                                                             |                                                                                                                                  |                                         |              |             |
| <b>33. Course Learning Outcomes (LOs), Teaching &amp; Learning Methods, and Assessment</b>                                                                                                                                                                                                                                                                                                                                  |                                                             |                                                                                                                                  |                                         |              |             |
| <b>Assessment Methods</b>                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Teaching &amp; Learning Methods</b>                      | <b>Learning Outcomes (LOs)</b>                                                                                                   |                                         |              |             |
| Short quizzes, theoretical questions                                                                                                                                                                                                                                                                                                                                                                                        | Traditional lectures, interactive lessons                   | Understand the theoretical basis of nonparametric tests and identify when they are appropriate alternatives to parametric tests. |                                         |              |             |
| Practical exercises, small projects                                                                                                                                                                                                                                                                                                                                                                                         | Practical learning using statistical software, case studies | Apply nonparametric tests for one sample, two samples, or more using real data.                                                  |                                         |              |             |
| Report analysis, evaluation tests                                                                                                                                                                                                                                                                                                                                                                                           | Practical lectures, group discussions                       | Analyze and interpret results of nonparametric tests in various contexts.                                                        |                                         |              |             |
| Software projects, oral presentations                                                                                                                                                                                                                                                                                                                                                                                       | Workshops, collaborative learning                           | Use statistical software (such as SPSS or R) to apply and analyze nonparametric tests.                                           |                                         |              |             |
| <b>34. Course Structure (Theoretical and Practical)</b>                                                                                                                                                                                                                                                                                                                                                                     |                                                             |                                                                                                                                  |                                         |              |             |
| <b>Assessment Method</b>                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Teaching Method</b>                                      | <b>Unit/Topic</b>                                                                                                                | <b>Intended Learning Outcomes</b>       | <b>Hours</b> | <b>Week</b> |
| Participatio                                                                                                                                                                                                                                                                                                                                                                                                                | Lecture, presentation                                       | Introduction to the course                                                                                                       | Understand course objectives and uses o | 3            | 1           |

|                                     |                                |                           |                                                                                            |   |    |
|-------------------------------------|--------------------------------|---------------------------|--------------------------------------------------------------------------------------------|---|----|
| n, short quiz                       |                                |                           | nonparametric methods                                                                      |   |    |
| Short quiz, practical problems      | Interactive lecture            | One-sample tests          | Identify advantages and disadvantages of nonparametric methods; apply tests for one sample | 3 | 2  |
| Practical exercise, result analysis | Practical lecture              | Goodness-of-fit tests     | Apply goodness-of-fit tests and interpret results                                          | 3 | 3  |
| Short project, report               | Lecture, discussion            | Independence tests        | Use independence tests to analyze variable relationships                                   | 3 | 4  |
| Evaluation test, group discussion   | Lecture, statistical analysis  | Wilcoxon test             | Perform sign rank tests; analyze related cases                                             | 3 | 5  |
| Comprehensive test                  | Interactive review             | Randomness test           | Review randomness tests and interpret outputs                                              | 3 | 6  |
| Short quiz                          | Lecture, practical explanation | Mann-Whitney test         | Analyze two independent samples using nonparametric tests                                  | 3 | 7  |
| Short quiz, problems                | Interactive lecture            | Wilcoxon test             | Compare two related samples using Wilcoxon test                                            | 3 | 8  |
| Analytical exercises                | Practical lecture              | Dispersion tests          | Analyze dispersion using nonparametric tests                                               | 3 | 9  |
| Comprehensive test                  | Interactive discussion         | Review and training       | Comprehensive review of previous topics                                                    | 3 | 10 |
| Small project, report               | Lecture, data analysis         | Kruskal-Wallis test       | Compare more than two samples using Kruskal-Wallis test                                    | 3 | 11 |
| Evaluation test, discussion         | Lecture, statistical analysis  | Friedman test             | Apply Friedman test for related samples                                                    | 3 | 12 |
| Practical test                      | Practical lecture              | SPSS Application (Part 1) | Use SPSS for one- and two-sample tests                                                     | 3 | 13 |
| Short quiz, report                  | Practical lecture              | SPSS Application (Part 2) | Use SPSS for tests with more than two samples                                              | 3 | 14 |

|                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>35. Course Development Plan</b>                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Objectives of the Development Plan:                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 16. Develop the content to focus on real examples and interpreting statistical results in practical contexts.                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 17. Include case studies and real datasets for analysis using nonparametric methods.                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 18. Train students to use modern software (such as R and Python) to apply nonparametric tests instead of manual calculation only.             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 19. Reduce reliance on traditional lectures and increase use of problem-based learning (PBL), teamwork, and interactive classroom activities. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>36. Infrastructure</b>                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Classrooms, Laboratories, Workshops</b>                                                                                                    | <b>Available</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Required Textbooks</b>                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Main References (Sources)</b>                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Recommended Books and References</b>                                                                                                       | <p>5. Adam, Ameen Ibrahim. (2005). Basic Statistical Principles in Applied Nonparametric Methods. King Fahd National Library, Saudi Arabia.</p> <p>6. Corder, Gregory &amp; Foreman, Dale. (2020). Nonparametric Statistics: A Step-by-Step Approach (Translated by Waseem bin Salman Nasir). King Fahd National Library, Saudi Arabia. (Original work published 2014)</p> <p>7. Bagdonavičius, V., Kruopis, J., &amp; Nikulin, M. S. (2011). Non-Parametric Tests for Complete Data. ISTE/Wiley.</p> <p>8. Kolassa, J. E. (2020). An Introduction to Nonparametric Statistics. CRC Press.</p> <p>9. Kvam, P., Vidakovic, B., &amp; Kim, S. J. (2022). Nonparametric Statistics with Applications to Science and Engineering with R. John Wiley &amp; Sons.</p> |
| <b>Electronic References, Websites, etc.</b>                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Experimental Design and Analysis

|                                                                                                                                                                   |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Educational Institution                                                                                                                                        |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| Technical Administrative College - Mosul / Department of Statistics and Informatics                                                                               |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| 2. Course Name/Code                                                                                                                                               |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| Experimental Design and Analysis / SIT411                                                                                                                         |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| 3. Available Attendance Formats                                                                                                                                   |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| Weekly                                                                                                                                                            |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| 4. Semester/Year                                                                                                                                                  |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| First and Second / 2025-2026                                                                                                                                      |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| 5. Number of Study Hours (Total)                                                                                                                                  |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| 56 hours (4 hours x 14 weeks)                                                                                                                                     |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| 6. Date of Preparation                                                                                                                                            |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| June 1, 2025                                                                                                                                                      |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| 7. Course Objectives (General Objectives of the Course)                                                                                                           |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| Teach students how to design various experiments regarding the homogeneity of experimental units, as well as to analyze the data obtained from those experiments. |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| 8. Course outcomes, teaching, learning and assessment methods                                                                                                     |                                                                                                                                                       |                                                                                                                                                                                                                                                                                         |
| assessment methods                                                                                                                                                | Teaching and learning methods                                                                                                                         | Outcomes                                                                                                                                                                                                                                                                                |
| .Exam -<br>Solving -<br>exercises in<br>.class<br>Asking -<br>questions to<br>students in<br>.class<br>Discussion and -<br>.dialogue                              | Theoretical -1<br>and practical<br>.lectures<br>Use of -2<br>educational<br>tools<br>(presentations<br>and scientific<br>Practical -3<br>.application | A- Knowledge<br>A1- The student will be able to understand the basics of experimental design and analysis.<br>A2- The student will be able to use mathematical models for randomized experiments.<br>A3- The student will be able to understand how to apply the material in real life. |
|                                                                                                                                                                   |                                                                                                                                                       | B - Skills<br>B1 - Be skilled at solving problems and<br>.designing and analyzing experiments<br>B2 - Be skilled at identifying the type of<br>.design<br>B3 - Be skilled at identifying optimal<br>.solution methods in analysis of variance                                           |
|                                                                                                                                                                   |                                                                                                                                                       | C- Values<br>C1- Academic and Ethical Integrity<br>C2- Critical and Analytical Thinking                                                                                                                                                                                                 |

|  |  |                                          |  |  |  |
|--|--|------------------------------------------|--|--|--|
|  |  | C3- Teamwork and Cooperation             |  |  |  |
|  |  | C4- Commitment to Quality and Excellence |  |  |  |
|  |  |                                          |  |  |  |

| 9. Course structure (theoretical and practical vocabulary) |                           |                                                                                                                                                                                                                                                                                               |                                     |       |        |
|------------------------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------|--------|
| Assessment Method                                          | Teaching Method           | Unit/Or Topic Name                                                                                                                                                                                                                                                                            | Required Learning Outcomes          | Hours | Week   |
| Daily and monthly tests                                    | Theoretical and practical | Simple Crossover Design Analysis of Variance Table<br>Factorial Experiments<br>Factorial Coefficients, Single Effects, and Interaction                                                                                                                                                        | Student understanding of the lesson | 4     | First  |
| Daily and monthly tests                                    | Theoretical and practical | A factorial experiment using a completely randomized design. Design and implementation of the experiment. Organizing the results of the experiment in multivariate tables. Mathematical model. Hypothesis testing for single and crossed effects. Analysis of variance table. Post-hoc tests. | Student understanding of the lesson | 4     | Second |
| Daily and monthly tests                                    | Theoretical and practical | Three-factor factorial experiment A factorial experiment that is applied in a randomized complete block design.                                                                                                                                                                               | Student understanding of the lesson | 4     | Third  |
| Daily and monthly tests                                    | Theoretical and practical | Design and implement the experiment. Organize the results of the experiment in multi-way tables. Mathematical model. Test hypotheses for single and combined effects.                                                                                                                         | Student understanding of the lesson | 4     | Fourth |
| Daily and monthly tests                                    | Theoretical and practical | Analysis of variance table for post-tests                                                                                                                                                                                                                                                     | Student understanding of the lesson | 4     | Fifth  |
| Daily and monthly tests                                    | Theoretical and practical | Three-factor factorial experiment A factorial experiment applied in a Latin square design                                                                                                                                                                                                     | Student understanding of the lesson | 4     | Sixth  |

|                         |                           |                                                                                                                                                                                                                                                                            |                                     |   |          |
|-------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---|----------|
| Daily and monthly tests | Theoretical and practical | Design and implementation of the experiment<br>Organizing the results of the experiment in multivariate tables<br>Mathematical model<br>Hypothesis testing for single and cross-effects<br>Analysis of variance table<br>Cross-sectional experiments                       | Student understanding of the lesson | 4 | Seventh  |
| Daily and monthly tests | Theoretical and practical | One-off split design                                                                                                                                                                                                                                                       | Student understanding of the lesson | 4 | Eighth   |
| Daily and monthly tests | Theoretical and practical | Its uses, advantages, and disadvantages.<br>Random distribution, applying complete plots in a completely randomized design.<br>Experiment planning and implementation.<br>Mathematical model.<br>Hypothesis testing and analysis of variance table. Post-experiment .tests | Student understanding of the lesson | 4 | Ninth    |
| Daily and monthly tests | Theoretical and practical | Application of complete plots in randomized complete block design, planning and implementation of the experiment, mathematical model, hypothesis testing tests and analysis of variance table, post-experimental tests                                                     | Student understanding of the lesson | 4 | Tenth    |
| Daily and monthly tests | Theoretical and practical | Applying whole plots in the Latin square design, planning and implementing the experiment, the mathematical model, testing hypotheses and an analysis of variance                                                                                                          | Student understanding of the lesson | 4 | Eleventh |

|                         |                           |                                                                                                                                                                                                                                                   |                                     |   |            |
|-------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---|------------|
|                         |                           | table, post-tests, split-plot design for two times                                                                                                                                                                                                |                                     |   |            |
| Daily and monthly tests | Theoretical and practical | Application of complete plots in a completely randomized design, application of complete plots in a completely randomized sector design, application of complete plots in a Latin square design                                                   | Student understanding of the lesson | 4 | Twelfth    |
| Daily and monthly tests | Theoretical and practical | Analysis of covariance // its uses, planning the experiment using a completely randomized design, tabulating the results, the mathematical model                                                                                                  | Student understanding of the lesson | 4 | Thirteenth |
| Daily and monthly tests | Theoretical and practical | Hypothesis testing and ANOVA table Finding the estimated regression equation Testing the hypothesis of the regression coefficient, correlation coefficient and testing its hypothesis), integration // (its use, its scale and ,its disadvantages | Student understanding of the lesson | 4 | Fourteenth |
|                         | Theoretical and practical | Final Exam                                                                                                                                                                                                                                        |                                     |   | Fifith     |

## 10. Curriculum development plan.

Continuously updating the curriculum to keep pace with labor market developments (Curriculum Update Committee, Scientific Committee), such as:

- 1.Developing curricula that are appropriate for the labor market
2. .Holding scientific seminars and conferences aimed at updating curricula
- 3.Monitoring scientific developments in the field of specialization

## 11. Infrastructure

|                                                                                                                       |                                                                          |
|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Available                                                                                                             | Classrooms, Laboratories, and Workshops                                  |
| Available                                                                                                             | 1- Required Textbooks                                                    |
| Design and Analysis of Agricultural Experiments / Dr. Khasha Mahmoud Al-Rawi and Dr. Abdul Aziz Muhammad Khalaf Allah | 2- Main References (Resources)                                           |
| Design and Analysis of Experiments – Dr. Muhammad Muhammad Al-Tahir Al-Imam                                           | a) Recommended books and references (scientific journals, reports, etc.) |

|                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <a href="https://www.noor-ok.com/tag/%D8%A7%D9%84%D8%5%D8%AD%D8%B5%D8%A7%D8%A1-D8%A7%D9%84%D8%AD%D9%8A%D9%88%D9%8A-D9%88%D8%AA%D8%B5%D9%85%D9%8A%D9%85-D8%A7%D9%84%D8%AA%D8%AC%D8%A7%D8%B1%D8%A8#google_vignette">https://www.noor-ok.com/tag/%D8%A7%D9%84%D8%5%D8%AD%D8%B5%D8%A7%D8%A1-D8%A7%D9%84%D8%AD%D9%8A%D9%88%D9%8A-D9%88%D8%AA%D8%B5%D9%85%D9%8A%D9%85-D8%A7%D9%84%D8%AA%D8%AC%D8%A7%D8%B1%D8%A8#google_vignette</a> | b) Electronic references, websites, etc. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|

## Random processes

|                                                                                                                         |                                                   |                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| 1. Educational Institution                                                                                              |                                                   |                                                                                                       |
| Technical Administrative College - Mosul / Department of Statistics and Informatics                                     |                                                   |                                                                                                       |
| 2. Course Name/Code                                                                                                     |                                                   |                                                                                                       |
| Random processes / SIT412                                                                                               |                                                   |                                                                                                       |
| 3. Available Attendance Formats                                                                                         |                                                   |                                                                                                       |
| Weekly                                                                                                                  |                                                   |                                                                                                       |
| 4. Semester/Year                                                                                                        |                                                   |                                                                                                       |
| First and Second / 2025-2026                                                                                            |                                                   |                                                                                                       |
| 5. Number of Study Hours (Total)                                                                                        |                                                   |                                                                                                       |
| 56 hours (4 hours x 14 weeks)                                                                                           |                                                   |                                                                                                       |
| 6. Date of Preparation                                                                                                  |                                                   |                                                                                                       |
| June 1, 2025                                                                                                            |                                                   |                                                                                                       |
| 7. Course Objectives (General Objectives of the Course)                                                                 |                                                   |                                                                                                       |
| The course aims to enable the student to learn the basics of randomness and the possibility of applying practical life. |                                                   |                                                                                                       |
| 8. Course outcomes, teaching, learning and assessment methods                                                           |                                                   |                                                                                                       |
| Outcomes                                                                                                                | Outcomes                                          | Outcomes                                                                                              |
| -Exam.<br>-Solving exercises in class.                                                                                  | -1Theoretical and practical lectures.<br>-2Use of | A- Knowledge<br>A1- Understanding the basics of probability<br>A2- Distinguishing different models of |

|                                                                                 |                                                                                                |                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>-Asking questions to students in class.</p> <p>-Discussion and dialogue.</p> | <p>educational tools (presentations and scientific films.(</p> <p>-3Practical application.</p> | <p>stochastic processes</p> <p>A3- Analyzing the properties of stochastic processes</p> <p>A4- Mathematical modeling of random phenomena</p>                                                                                                              |
|                                                                                 |                                                                                                | <p>B - Skills</p> <p>B1 - Analytical and Mathematical Skills</p> <p>B2 - Mathematical Modeling Skills</p> <p>B3 - Critical Thinking and Problem-Solving Skills</p> <p>B4 - Programming and Computing Skills, such as the Use of Softwares Like MATLAB</p> |
|                                                                                 |                                                                                                | <p>C - Values</p> <p>C1 - Academic and Ethical Integrity</p> <p>C2 - Critical and Analytical Thinking</p> <p>C3 - Teamwork and Collaboration</p> <p>C4 - Commitment to Quality and Excellence</p>                                                         |
|                                                                                 |                                                                                                |                                                                                                                                                                                                                                                           |

| 9.Course structure (theoretical and practical vocabulary) |                         |                                                       |                                     |       |            |
|-----------------------------------------------------------|-------------------------|-------------------------------------------------------|-------------------------------------|-------|------------|
| Assessment Method                                         | Teaching Method         | Unit/Or Topic Name                                    | Required Learning Outcomes          | Hours | Week       |
| Theoretical and practical                                 | Daily and monthly tests | Introduction to Stochastic Processes                  | Student understanding of the lesson | 4     | First      |
| =                                                         | =                       | Definitions with Examples of Stochastic Processes     | Student understanding of the lesson | 4     | Second     |
| =                                                         | =                       | Markov Chains                                         | Student understanding of the lesson | 4     | Third      |
| =                                                         | =                       | Upper-order Transition Probabilities                  | Student understanding of the lesson | 4     | Fourth     |
| =                                                         | =                       | Classification of Markov Chains                       | Student understanding of the lesson | 4     | Fifth      |
| =                                                         | =                       | Aerodynamic Case with Examples                        | Student understanding of the lesson | 4     | Sixth      |
| =                                                         | =                       | Random Walks                                          | Student understanding of the lesson | 4     | Seventh    |
| =                                                         | =                       | Counting Operations and the Random Property           | Student understanding of the lesson | 4     | Eighth     |
| =                                                         | =                       | Poisson Process and Its Properties                    | Student understanding of the lesson | 4     | Ninth      |
| =                                                         | =                       | Interarrival Times and Their Probability Distribution | Student understanding of the lesson | 4     | Tenth      |
| =                                                         | =                       | Branching Processes                                   | Student understanding of the lesson | 4     | Eleventh   |
| =                                                         | =                       | Extinction Probabilities                              | Student understanding of the lesson | 4     | Twelfth    |
| =                                                         | =                       | Random Processes in Queues                            | Student understanding of the lesson | 4     | Thirteenth |
| =                                                         | =                       | Random Processes in Queuing Models                    | Student understanding of the lesson | 4     | Fourteenth |
| =                                                         | =                       | Final Exam                                            | Student understanding of the lesson |       | Fifth      |

## 10. Curriculum development plan.

Continuously updating the curriculum to keep pace with labor market developments

|                                                                                                                                                                                                                                                                                          |                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| (Curriculum Update Committee, Scientific Committee), such as:<br>1. Developing curricula that are appropriate for the labor market<br>2. Holding scientific seminars and conferences aimed at updating curricula<br>3. Monitoring scientific developments in the field of specialization |                                                                          |
| <b>11. Infrastructure</b>                                                                                                                                                                                                                                                                |                                                                          |
| <b>متوفرة</b>                                                                                                                                                                                                                                                                            | Classrooms, Laboratories, and Workshops                                  |
| <b>Stochastic Processes / Immanuel Barzin</b>                                                                                                                                                                                                                                            | 1- Required Textbooks                                                    |
|                                                                                                                                                                                                                                                                                          | 2- Main References (Resources)                                           |
| file:///C:/Users/PC/Downloads/Noor-book.com%20%D8%A7%D9%84%<br>%B9%D9%85%D9%84%D9%8A%D8<br>A7%D8%AA%20%D8%A7%D9%84%<br>8%AA%D8%B5%D8%A7%D8%AF%D<br>9%81%D9%8A%D8%A9.pdf                                                                                                                  | a) Recommended books and references (scientific journals, reports, etc.) |
|                                                                                                                                                                                                                                                                                          | b) Electronic references, websites, etc.                                 |

## SPECIFICATION Principal of Statistical Inference

|                                       |                                                                                                   |
|---------------------------------------|---------------------------------------------------------------------------------------------------|
| 1. Teaching Institution               | Technical college of Management/Mosul                                                             |
| 2. University<br>Department/Centre    | <b>Northern Technical University/<br/>Department of Statistics and Informatics<br/>Techniques</b> |
| 3. Course title/code                  | Principal of Statistical Inference / SIT413                                                       |
| 4. Programmed to which it contributes |                                                                                                   |
| 5. Modes of Attendance offered        | weekly                                                                                            |
| 6. Semester/Year                      | First and second semester                                                                         |

|                                                      |           |
|------------------------------------------------------|-----------|
| 7. Number of hours tuition (total)                   | 4x14 = 56 |
| 8. Date of production/revision of this specification | 2025      |
|                                                      |           |

|                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10· Learning Outcomes, Teaching ,Learning and Assessment Methods                                                                                                                                                                                                                                                                                                                                                                  |
| <p>A- Knowledge and Understanding:</p> <p>A1- The new student understands the basics of Point Estimation</p> <p>A2- Properties of Good Point Estimator.</p> <p>A3- The student's ability to know how to apply the subject in free life</p> <p>A4- It includes monitoring or relationships related to data, interpreting the relationship and its components, interpreting shapes and graphs, interpreting statistical tables.</p> |
| <p>B- Subject-specific skills.</p> <p>B1 - Be skilled in solving estimation problems.</p> <p>B2 - He should be skilled in knowing the type of distribution in which the data is distribute and applying the estimation methods.</p> <p>B3 - Be skilled in determining the function of the data through distribution</p>                                                                                                           |
| Teaching and Learning Methods                                                                                                                                                                                                                                                                                                                                                                                                     |
| <p>1- Theoretical and practical lectures.</p> <p>2- Using blended style of teaching.</p> <p>2- Using educational means (scientific presentations and films(</p> <p>3 -Practical application</p>                                                                                                                                                                                                                                   |
| Assessment methods                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p>-Solving exercises in class.</p> <p>-Asking questions to students in class</p> <p>-Discussion and dialogue</p> <p>- Using the google classroom.</p>                                                                                                                                                                                                                                                                            |

|                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C. Thinking Skills<br>C1. The ability to use mental ability to solve problems<br>C2- Using logical thinking<br>C2.<br>C3.<br>C4.                                                                                |
| Teaching and Learning Methods                                                                                                                                                                                   |
| -Theoretical and practical lectures<br>-Power-point presentation. And the screen                                                                                                                                |
| Assessment methods                                                                                                                                                                                              |
| Theoretical and practical tests, semester and final                                                                                                                                                             |
| D. General and Transferable Skills (other skills relevant to employability and personal development)<br>D1. Developing the student's mental abilities<br>D2- Developing skill capabilities<br>D2.<br>D3.<br>D4. |

| 11. Course Structure |       |                                     |                                                                                    |                           |                         |
|----------------------|-------|-------------------------------------|------------------------------------------------------------------------------------|---------------------------|-------------------------|
| Week ILOs            | Hours | ILOs                                | Unit/Module or Topic Title                                                         | Teaching Method           | Assessment Method       |
| First                | 4     | Student understanding of the lesson | Estimation Theory( General concepts and definitions)                               | Theoretical and practical | Daily and monthly tests |
| Second               | 4     | =                                   | Point Estimation, properties of good point estimation                              | =                         | =                       |
| Third                | 4     | =                                   | Unbiasedness, consistency( closeness)                                              | =                         | =                       |
| Fourth               | 4     | =                                   | Efficiency, Mean Square Error                                                      | =                         | =                       |
| Fifth                | 4     | =                                   | Fisher Information, Cramer                                                         | =                         | =                       |
| VI                   | 4     | =                                   | Minimum Variance Bound                                                             | =                         | =                       |
| Seventh              | 4     | =                                   | Exams                                                                              | =                         | =                       |
| VIII                 | 4     | =                                   | Sufficiency, Factorization Theorem, Completeness                                   | =                         | =                       |
| Ninth                | 4     | =                                   | Rao-Blackwell Theorem ,                                                            | =                         | =                       |
| The tenth            | 4     | =                                   | Exponential Family of Distribution<br>Methods of Point Estimation – Moments Method | =                         | =                       |
| Eleventh             | 4     | =                                   | Maximum Likelihood Method – Properties of M.L.E                                    | =                         | =                       |
| Twelfth              | 4     | =                                   | ., Least Square Method<br>(Minimum Variance Method)                                | =                         | =                       |
| Thirteenth           | 4     | =                                   | Bayesian Method                                                                    | =                         | =                       |
| Fourteenth           | 4     | =                                   | Interval Estimation (General Concepts and Definitions).                            | =                         | =                       |
| Fifteenth            | 4     | =                                   | Semester exam                                                                      | =                         | =                       |

| 12. Infrastructure                                                                          |                                                                                           |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Required reading:<br>· CORE TEXTS<br>· COURSE MATERIALS<br>· OTHER                          | Statistical Inference/ Jalal Al-ssayad                                                    |
| Special requirements (include for example workshops, periodicals, IT software, websites)    | Mathematical statistics / Amir Hanna                                                      |
| Community-based facilities (include for example, guest Lectures, internship, field studies) | <a href="https://archive.org/details/00147-pdf">https://archive.org/details/00147-pdf</a> |

## Nonparametric Methods

|                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                             |                                                                                                                                  |                                                                |       |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-------|------|
| 37. Educational Institution                                                                                                                                                                                                                                                                                                                                                                                                 |                                                             |                                                                                                                                  |                                                                |       |      |
| College of Administrative Technology-Mosul                                                                                                                                                                                                                                                                                                                                                                                  |                                                             |                                                                                                                                  |                                                                |       |      |
| 38. Department                                                                                                                                                                                                                                                                                                                                                                                                              |                                                             |                                                                                                                                  |                                                                |       |      |
| Department of Statistics and Informatics Techniques                                                                                                                                                                                                                                                                                                                                                                         |                                                             |                                                                                                                                  |                                                                |       |      |
| 39. Course Name / Code                                                                                                                                                                                                                                                                                                                                                                                                      |                                                             |                                                                                                                                  |                                                                |       |      |
| Nonparametric Methods / SIT414                                                                                                                                                                                                                                                                                                                                                                                              |                                                             |                                                                                                                                  |                                                                |       |      |
| 40. Attendance Forms Available                                                                                                                                                                                                                                                                                                                                                                                              |                                                             |                                                                                                                                  |                                                                |       |      |
| In-Person                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                             |                                                                                                                                  |                                                                |       |      |
| 41. Semester / Academic Year                                                                                                                                                                                                                                                                                                                                                                                                |                                                             |                                                                                                                                  |                                                                |       |      |
| First Semester / Fourth Year                                                                                                                                                                                                                                                                                                                                                                                                |                                                             |                                                                                                                                  |                                                                |       |      |
| 42. Total Hours                                                                                                                                                                                                                                                                                                                                                                                                             |                                                             |                                                                                                                                  |                                                                |       |      |
| 3 Hours                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                             |                                                                                                                                  |                                                                |       |      |
| 43. Date of Preparing this Description                                                                                                                                                                                                                                                                                                                                                                                      |                                                             |                                                                                                                                  |                                                                |       |      |
| 2025/6/15                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                             |                                                                                                                                  |                                                                |       |      |
| 44. Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                       |                                                             |                                                                                                                                  |                                                                |       |      |
| <ul style="list-style-type: none"> <li>Enable students to understand and apply nonparametric tests in data analysis.</li> <li>Develop the ability to select the appropriate test based on data characteristics.</li> <li>Enhance students' skills in analyzing and interpreting nonparametric statistical results.</li> <li>Train students to use statistical software to apply and analyze nonparametric tests.</li> </ul> |                                                             |                                                                                                                                  |                                                                |       |      |
| 45. Course Learning Outcomes (LOs), Teaching & Learning Methods, and Assessment                                                                                                                                                                                                                                                                                                                                             |                                                             |                                                                                                                                  |                                                                |       |      |
| Assessment Methods                                                                                                                                                                                                                                                                                                                                                                                                          | Teaching & Learning Methods                                 | Learning Outcomes (LOs)                                                                                                          |                                                                |       |      |
| Short quizzes, theoretical questions                                                                                                                                                                                                                                                                                                                                                                                        | Traditional lectures, interactive lessons                   | Understand the theoretical basis of nonparametric tests and identify when they are appropriate alternatives to parametric tests. |                                                                |       |      |
| Practical exercises, small projects                                                                                                                                                                                                                                                                                                                                                                                         | Practical learning using statistical software, case studies | Apply nonparametric tests for one sample, two samples, or more using real data.                                                  |                                                                |       |      |
| Report analysis, evaluation tests                                                                                                                                                                                                                                                                                                                                                                                           | Practical lectures, group discussions                       | Analyze and interpret results of nonparametric tests in various contexts.                                                        |                                                                |       |      |
| Software projects, oral presentations                                                                                                                                                                                                                                                                                                                                                                                       | Workshops, collaborative learning                           | Use statistical software (such as SPSS or R) to apply and analyze nonparametric tests.                                           |                                                                |       |      |
| 46. Course Structure (Theoretical and Practical)                                                                                                                                                                                                                                                                                                                                                                            |                                                             |                                                                                                                                  |                                                                |       |      |
| Assessment Method                                                                                                                                                                                                                                                                                                                                                                                                           | Teaching Method                                             | Unit/Topic                                                                                                                       | Intended Learning Outcomes                                     | Hours | Week |
| Participation, short                                                                                                                                                                                                                                                                                                                                                                                                        | Lecture, presentation                                       | Introduction to the course                                                                                                       | Understand course objectives and uses of nonparametric methods | 3     | 1    |

|                                     |                                |                           |                                                                                            |   |    |
|-------------------------------------|--------------------------------|---------------------------|--------------------------------------------------------------------------------------------|---|----|
| quiz                                |                                |                           |                                                                                            |   |    |
| Short quiz, practical problems      | Interactive lecture            | One-sample tests          | Identify advantages and disadvantages of nonparametric methods; apply tests for one sample | 3 | 2  |
| Practical exercise, result analysis | Practical lecture              | Goodness-of-fit tests     | Apply goodness-of-fit tests and interpret results                                          | 3 | 3  |
| Short project, report               | Lecture, discussion            | Independence tests        | Use independence tests to analyze variable relationships                                   | 3 | 4  |
| Evaluation test, group discussion   | Lecture, statistical analysis  | Wilcoxon test             | Perform sign rank tests; analyze related cases                                             | 3 | 5  |
| Comprehensive test                  | Interactive review             | Randomness test           | Review randomness tests and interpret outputs                                              | 3 | 6  |
| Short quiz                          | Lecture, practical explanation | Mann-Whitney test         | Analyze two independent samples using nonparametric tests                                  | 3 | 7  |
| Short quiz, problems                | Interactive lecture            | Wilcoxon test             | Compare two related samples using Wilcoxon test                                            | 3 | 8  |
| Analytical exercises                | Practical lecture              | Dispersion tests          | Analyze dispersion using nonparametric tests                                               | 3 | 9  |
| Comprehensive test                  | Interactive discussion         | Review and training       | Comprehensive review of previous topics                                                    | 3 | 10 |
| Small project, report               | Lecture, data analysis         | Kruskal-Wallis test       | Compare more than two samples using Kruskal-Wallis test                                    | 3 | 11 |
| Evaluation test, discussion         | Lecture, statistical analysis  | Friedman test             | Apply Friedman test for related samples                                                    | 3 | 12 |
| Practical test                      | Practical lecture              | SPSS Application (Part 1) | Use SPSS for one- and two-sample tests                                                     | 3 | 13 |
| Short quiz, report                  | Practical lecture              | SPSS Application (Part 2) | Use SPSS for tests with more than two samples                                              | 3 | 14 |

## 47. Course Development Plan

|                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objectives of the Development Plan:                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 20. Develop the content to focus on real examples and interpreting statistical results in practical contexts.                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 21. Include case studies and real datasets for analysis using nonparametric methods.                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 22. Train students to use modern software (such as R and Python) to apply nonparametric tests instead of manual calculation only.             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 23. Reduce reliance on traditional lectures and increase use of problem-based learning (PBL), teamwork, and interactive classroom activities. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 48. Infrastructure                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Classrooms, Laboratories, Workshops</b>                                                                                                    | <b>Available</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Required Textbooks</b>                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Main References (Sources)</b>                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Recommended Books and References</b>                                                                                                       | <p>10. Adam, Ameen Ibrahim. (2005). Basic Statistical Principles in Applied Nonparametric Methods. King Fahd National Library, Saudi Arabia.</p> <p>11. Corder, Gregory &amp; Foreman, Dale. (2020). Nonparametric Statistics: A Step-by-Step Approach (Translated by Waseem bin Salman Nasir). King Fahd National Library, Saudi Arabia. (Original work published 2014)</p> <p>12. Bagdonavičius, V., Kruopis, J., &amp; Nikulin, M. S. (2011). Non-Parametric Tests for Complete Data. ISTE/Wiley.</p> <p>13. Kolassa, J. E. (2020). An Introduction to Nonparametric Statistics. CRC Press.</p> <p>14. Kvam, P., Vidakovic, B., &amp; Kim, S. J. (2022). Nonparametric Statistics with Applications to Science and Engineering with R. John Wiley &amp; Sons.</p> |
| <b>Electronic References, Websites, etc.</b>                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## Multivariate Analysis

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 49. Educational Institution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| College of Administrative Technology-Mosul                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 50. Department                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Department of Statistics and Informatics Techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 51. Course Name / Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Multivariate Analysis / SIT401                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 52. Attendance Forms Available                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| In-Person                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 53. Semester / Academic Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| First Semester / Fourth Year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 54. Total Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 3 Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 55. Date of Preparing this Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2025/6/15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 56. Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>• Provide students with theoretical foundations of linear algebra related to multivariate data analysis.</li> <li>• Develop students' ability to select and apply appropriate multivariate statistical analysis methods.</li> <li>• Enhance students' skills in using statistical software (such as SPSS and R) to perform advanced multivariate procedures and interpret outputs.</li> <li>• Equip students with skills to analyze large and complex datasets and understand relationships among variables using techniques like Principal Component Analysis (PCA).</li> </ul> |
| 57. Course Learning Outcomes (LOs), Teaching & Learning Methods, and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Assessment                                      |                                             |                                                                    |                                                                                                                  |       |      |
|-------------------------------------------------|---------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------|------|
| Assessment Methods                              |                                             | Teaching & Learning Methods                                        | Learning Outcomes (LOs)                                                                                          |       |      |
| Short quizzes, computational assignments        |                                             | Theoretical lectures, visual explanations, classroom exercises     | Understand the basic concepts of linear algebra (matrices, eigenvalues) and apply them in multivariate analysis. |       |      |
| Applied exercises, result reports               |                                             | Practical lab learning, interactive lessons, programming workshops | Implement multiple and multivariate regression techniques using SPSS and R.                                      |       |      |
| Analytical project, oral presentation           |                                             | Case studies, group projects, programming workshops                | Apply advanced analysis techniques (PCA, factor analysis) on real datasets.                                      |       |      |
| Critical report, evaluation test                |                                             | Classroom discussions, critical analysis of software outputs       | Evaluate the adequacy of multivariate models and interpret results while considering ethical aspects.            |       |      |
| 58.Course Structure (Theoretical and Practical) |                                             |                                                                    |                                                                                                                  |       |      |
| Assessment Method                               | Teaching Method                             | Unit/Topic                                                         | Intended Learning Outcomes                                                                                       | Hours | Week |
| Participation, simple exercise                  | Lecture, classroom examples                 | Review of Linear Algebra and Matrices                              | Understand basic linear algebra concepts and matrices                                                            | 3     | 1    |
| Short quiz                                      | Lecture, practical activity                 | Eigenvalues and Applications                                       | Analyze eigenvalues and eigenvectors                                                                             | 3     | 2    |
| Applied test                                    | Lecture, case study                         | Multivariate Data and Applications                                 | Distinguish between types of multivariate data                                                                   | 3     | 3    |
| Analytical report                               | Lecture, R programming                      | Multiple Linear Regression                                         | Apply multiple linear regression                                                                                 | 3     | 4    |
| Results analysis, report                        | Lecture, SPSS application                   | Multivariate Analysis of Variance (MANOVA)                         | Understand and apply MANOVA                                                                                      | 3     | 5    |
| Short quiz                                      | Lecture, case study                         | Discriminant Analysis                                              | Perform discriminant analysis                                                                                    | 3     | 6    |
| Practical exercises                             | Practical application, classroom discussion | Cluster Analysis                                                   | Classify observations into groups                                                                                | 3     | 7    |
| Practical test                                  | Lecture, practical application              | Principal Component Analysis                                       | Apply Principal Component Analysis (PCA)                                                                         | 3     | 8    |
| Comparative analysis, report                    | Lecture, interactive discussion             | Factor Analysis                                                    | Compare PCA and Factor Analysis                                                                                  | 3     | 9    |
| Practical assignment                            | Workshop, R programming                     | Data Preprocessing                                                 | Clean and prepare data                                                                                           | 3     | 10   |
| Analytical                                      | Lecture, interpret applications             | Statistical Software Outputs                                       | Read and interpret SPSS and R outputs                                                                            | 3     | 11   |

|                          |                                   |                              |                                                   |   |    |
|--------------------------|-----------------------------------|------------------------------|---------------------------------------------------|---|----|
| test                     |                                   |                              |                                                   |   |    |
| Evaluation test          | Lecture, critical analysis        | Optimal Model Selection      | Distinguish between model selection methods       | 3 | 12 |
| Presentation, discussion | Practical discussion case study   | Analysis and Decision-Making | Connect statistical analysis with decision-making | 3 | 13 |
| Comprehensive test       | Classroom review summary exercise | General Review               | Comprehensive review multivariate analysis        | 3 | 14 |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>59. Course Development Plan</b>                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                               |
| Objectives of the Development Plan:<br>24.Introduce new applications such as multivariate time series analysis and Big Data analytics.<br>25.Link the course to real-world problems and datasets from fields like economics, health, education, and marketing.<br>26.Use methods like problem-based learning (PBL) and teamwork on projects.<br>27.Add updated books and research that focus on multivariate statistics applications using software. |                                                                                                                                                                                                                                               |
| <b>60. Infrastructure</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                               |
| <b>Classrooms, Laboratories, Workshops</b>                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Available</b>                                                                                                                                                                                                                              |
| <b>Required Textbooks</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                               |
| <b>Main References (Sources)</b>                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                               |
| <b>Recommended Books and References</b>                                                                                                                                                                                                                                                                                                                                                                                                              | Rencher, A. C., & Christensen, W. F., (2012), "Methods of Multivariate Analysis", 3rd Edition, John Wiley & Sons.<br>Anderson, T.W., (2003), "An Introduction to Multivariate Statistical Analysis", 3rd Edition, John Wiley and Sons, U.S.A. |
| <b>Electronic References, Websites, etc.</b>                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                               |

## Random Multivariate

|                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                             |                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| 61. Educational Institution                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                             |                                                                                                       |
| College of Administrative Technology-Mosul                                                                                                                                                                                                                                                                                                                                                                                                    |                                                             |                                                                                                       |
| 62. Department                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                             |                                                                                                       |
| Department of Statistics and Informatics Techniques                                                                                                                                                                                                                                                                                                                                                                                           |                                                             |                                                                                                       |
| 63. Course Name / Code                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                             |                                                                                                       |
| Random Multivariate / SIT4150                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                             |                                                                                                       |
| 64. Attendance Forms Available                                                                                                                                                                                                                                                                                                                                                                                                                |                                                             |                                                                                                       |
| In-Person                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                             |                                                                                                       |
| 65. Semester / Academic Year                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                             |                                                                                                       |
| Second Semester / Fourth Year                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                             |                                                                                                       |
| 66. Total Hours                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                             |                                                                                                       |
| 3 Hours                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                             |                                                                                                       |
| 67. Date of Preparing this Description                                                                                                                                                                                                                                                                                                                                                                                                        |                                                             |                                                                                                       |
| 2025/6/15                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                             |                                                                                                       |
| 68. Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                             |                                                                                                       |
| <ul style="list-style-type: none"> <li>• Enable students to understand and apply the multivariate normal distribution in data analysis.</li> <li>• Develop skills for parameter estimation and hypothesis testing in multivariate data.</li> <li>• Enhance students' ability to analyze complex data and interpret statistical test results.</li> <li>• Train students to use statistical software for multivariate data analysis.</li> </ul> |                                                             |                                                                                                       |
| 69. Course Learning Outcomes (LOs), Teaching & Learning Methods, and Assessment                                                                                                                                                                                                                                                                                                                                                               |                                                             |                                                                                                       |
| <b>Assessment Methods</b>                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Teaching &amp; Learning Methods</b>                      | <b>Learning Outcomes (LOs)</b>                                                                        |
| Theoretical tests, oral questions, short quizzes                                                                                                                                                                                                                                                                                                                                                                                              | Traditional lectures, interactive lessons, case studies     | Understand the characteristics of the multivariate normal distribution and apply it in data analysis. |
| Practical exercises, analytical reports, small projects                                                                                                                                                                                                                                                                                                                                                                                       | Practical lectures, workshops using R/SPSS                  | Estimate parameters (mean, variance, covariance) in multivariate distributions.                       |
| Evaluation tests, presentation of results, final project                                                                                                                                                                                                                                                                                                                                                                                      | Case analysis, group-based applied learning, field examples | Conduct multivariate hypothesis testing and interpret results.                                        |
| Analytical project, software skill assessment                                                                                                                                                                                                                                                                                                                                                                                                 | Practical learning, data simulation, direct application     | Use statistical software to analyze distributions and estimate parameters.                            |
| 70. Course Structure (Theoretical and Practical)                                                                                                                                                                                                                                                                                                                                                                                              |                                                             |                                                                                                       |

| Assessment Method                    | Teaching Method                         | Unit/Topic                                     | Intended Learning Outcomes                                           | Hours | Week |
|--------------------------------------|-----------------------------------------|------------------------------------------------|----------------------------------------------------------------------|-------|------|
| Preliminary test                     | Lecture, illustrative examples          | Introduction to Multivariate Random Variables  | Understand the concept of the multivariate normal distribution       | 3     | 1    |
| Classroom exercises                  | Lecture, numerical applications         | Means and Joint Variance                       | Understand the properties of mean, variance, and covariance          | 3     | 2    |
| Short quiz                           | Lecture, graphical analysis             | Properties of Multivariate Normal Distribution | Apply the multivariate normal distribution                           | 3     | 3    |
| Results analysis, practical exercise | Lecture, R programming                  | Estimation Methods (MLE, Sample Moments)       | Verify and estimate parameters using sample                          | 3     | 4    |
| Written test                         | Lecture, case study                     | T Distribution and its Properties              | Understand the multivariate T distribution                           | 3     | 5    |
| Applied test                         | Workshop, scenarios                     | Hypothesis Testing                             | Differentiate between univariate and multivariate hypothesis testing | 3     | 6    |
| Analytical exercises                 | Lecture, programming and interpretation | Wishart Distribution                           | Understand the Wishart distribution and its applications             | 3     | 7    |
| Mini project                         | Lab application                         | Analysis with SPSS/R                           | Perform advanced tests using software                                | 3     | 8    |
| Conceptual evaluation test           | Interactive discussion                  | Distribution Comparisons                       | Compare multivariate distributions                                   | 3     | 9    |
| Software output analysis             | Lecture, practical training             | Multivariate Covariance Analysis               | Analyze covariance and interpret relationships                       | 3     | 10   |
| Analytical report                    | Group workshop                          | Real Data Analysis                             | Apply the multivariate normal distribution to real data              | 3     | 11   |
| Comprehensive test                   | Class review, group applications        | Comprehensive Review                           | Review concepts and apply comprehensive tests                        | 3     | 12   |
| Project progress follow-up           | Individual guidance, analytical support | Applied Project                                | Prepare final projects and analyze data                              | 3     | 13   |
| Peer evaluation, oral report         | Group presentation                      | Project Presentations                          | Present real data analysis projects                                  | 3     | 14   |

## 71. Course Development Plan

|                                                                                                                                 |                  |
|---------------------------------------------------------------------------------------------------------------------------------|------------------|
| Objectives of the Development Plan:                                                                                             |                  |
| 28.Include case studies and analysis of multidimensional datasets from fields such as health, economics, and environment.       |                  |
| 29.Integrate advanced content like the Wishart distribution, multivariate T distribution, and multivariate covariance analysis. |                  |
| 30.Apply interactive teaching methods such as project-based learning and active learning.                                       |                  |
| 31.Train students to critically evaluate model results and not rely blindly on software outputs.                                |                  |
| 72. Infrastructure                                                                                                              |                  |
| <b>Classrooms, Laboratories, Workshops</b>                                                                                      | <b>Available</b> |
| <b>Required Textbooks</b>                                                                                                       |                  |