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

Department of Atmospheric Sciences / College of Science/ Mustansiriyah University

2024-2025

Guide to Academic Program and Course Description

2025

Introduction:

The educational program is a coordinated and organized package of courses that includes procedures and experiences designed to build and refine the skills of graduates, making them qualified to meet the requirements of the labor market. It is reviewed and evaluated annually through internal or external auditing procedures and programs, such as the External Examiner Program.

The academic program description provides a brief summary of the main features of the program and its courses, highlighting the skills imparted to students based on the program's objectives. The importance of this description lies in its role as a cornerstone for obtaining program accreditation. It is written by the teaching staff under the supervision of the scientific committees in the academic departments.

This second edition of the guide includes an updated description of the academic program, reflecting the latest developments and updates in the educational system in Iraq. It includes descriptions of academic programs in their traditional formats (annual, semester) and adopts the academic program description generalized according to the letter of the Directorate of Studies No. T M 3/2906 dated 3/5/2023 for programs based on the Bologna Process.

In this context, we emphasize the importance of writing academic program and course descriptions to ensure the proper conduct of the educational process.

Concepts and Terminology:

Academic Program Description: Provides a concise summary of the program's vision, mission, and objectives, including a detailed description of the targeted learning outcomes according to specific learning strategies.

Course Description: Offers a concise summary of the main characteristics of the course and the expected learning outcomes that the student is supposed to achieve, demonstrating whether the student has maximized the learning opportunities available. It is derived from the program description.

Program Vision: An ambitious vision for the future of the academic program, aiming to be advanced, inspiring, motivating, realistic, and feasible.

Program Mission: Clarifies the goals and activities necessary to achieve them concisely and determines the program's developmental paths and directions.

Program Objectives: Statements that describe what the academic program intends to achieve within a specified period, and they should be measurable and observable.

Curriculum Structure: All the courses included in the academic program according to the adopted learning system (semester, annual, Bologna Process), whether they are required (ministry, university, college, and academic department) along with the number of credit units.

Learning Outcomes: A coherent set of knowledge, skills, and values that the student has acquired upon successful completion of the academic program. Each course's learning outcomes should be defined in a way that achieves the program's objectives.

Teaching and Learning Strategies: Strategies used by the faculty member to develop student education and learning, which are plans followed to achieve learning objectives. They describe all in-class and out-of-class activities to achieve the program's learning outcomes.

Academic Program Description Template

University Name: University of Mustansiriyah
College/Institute: College of Science
Academic Department: Department of Atmospheric Sciences
Name of the Academic or Professional Program: Bachelor of Atmospheric Sciences
Name of the Final Degree: Bachelor in Atmospheric Sciences
Study System: Semester System
Date of Description Preparation: 6/3/2025
Date of Document Completion: 22/4/2025

Signature:

Name of the Department Head:

Assist. Prof. Dr. Asraa Khtan Abdulkareem

Date:

Signature:

Name of the Scientific Associate:

Assist. Prof. Dr. Ahmed Mahdi Rheima

Date:

The document has been reviewed by the Quality Assurance and University Performance Division

Name of the Director of the Quality Assurance and University Performance Division:

Assist. Prof. Dr. Ali Jasim Mohammed

Signature:

Date:

Signature:

Approval of the Dean: **Prof. Dr. Methaq Talib Gaata**

Date:

1. Program Vision

Our vision is to lead in atmospheric sciences and develop the necessary knowledge to solve problems related to weather, climate, water scarcity, and air quality. We aim to predict extreme weather events, support renewable energy, and find environmentally friendly solutions to reduce the impact of climate change.

2. Program Mission

Our mission is to build an integrated program to enhance the understanding of Earth and the atmosphere through education and community engagement. This will be achieved by:

- Preparing specialists in atmospheric sciences qualified to find new methods for diagnosing and proposing solutions to current environmental and sustainability challenges, as well as the impacts of climate change.
- Building a curriculum within the department's precise specializations and activating the work of joint research teams between undergraduate students and faculty members.
- Collaborating with educational and research institutions and relevant entities, both locally and globally, to enhance the scientific base, keep up with the latest developments in the field, provide scientific consultations, and engage in strategic projects that contribute to improving environmental and climate conditions.
- Motivating community to address the factors affecting building the future of our nation and the region, through optimal use of Earth's resources, mitigating natural risks, preserving the environment, and confronting climate change.

3. Program Objectives

The Department of Atmospheric Sciences aims to:

- Enhance our national and international reputation in education and scientific research.
- Train graduates and stakeholders to use modern technologies and software.
- Updating the curriculum to keep pace with global scientific development and linking research and study plans to the actual needs of the current and future labor market.

- Contribute to the preparation of scientific and applied research and studies in the fields of atmospheric sciences and related sciences, which help find solutions to environmental problems faced by Iraq and the region, such as cloud seeding and increasing vegetation cover using globally recognized scientific methods.
- Establish effective partnerships locally and globally with universities and relevant community sectors.
- Achieve excellence in higher education, scientific research, and community service.
- Prepare, qualify, and develop specialized scientific personnel in atmospheric sciences.
- Achieving quality assurance and accreditation in the educational process by establishing or contributing to distinguished research units and centers with global reliability.
- Promoting scientific and societal culture in preserving the environment, adapting, and reducing the impact of climate change by activating the principle of volunteer work.

4. Program Accreditation

Not available

5. Other External Influences

Not available

6. Program Structure

Program Structure	Number of Courses	Credit Units	Percentage	Notes*
Institution Requirements	2	2	2.8%	
College Requirements	2	4	5.6%	
Department Requirements	26	66	91.6%	
Summer Training	Elective			
Others				Scientific Visits (4)

*Notes may include whether the course is core or elective.

7. Program Description				
Year/Level	**Course Code**	**Course Name**	**Credits Hours**	
			Theoretical	Practical
Third Year (First Semester) 2024-2025	508631012	Weather Forecasting I	2	2
	508631062	Atmospheric Boundary Layer I	2	2
	508631072	Atmospheric Dynamics I	2	
	508631022	Principles of Remote Sensing	2	2
	508631052	Climatology	2	
	508631032	Complex Analysis	2	
	508631042	Aviation Meteorology	2	
Third Year (Second Semester) 2024-2025	508632092	Weather Forecasting II	2	2
	508632142	Atmospheric Boundary Layer II	2	2
	508632152	Atmospheric Dynamics II	2	
	508632102	Remote Sensing of the Atmospheric	2	2
	508632132	Climate Changes	2	
	508632112	Special Functions	2	
	508632122	Biometeorology	2	
	508631081	English Language	1	
Fourth Year (First Semester) 2024-2025	508641022	Cloud Physics	2	2
	508641032	Air Pollution I	2	2
	508641052	Upper Atmospheric Layers	2	
	508641012	Numerical Weather Prediction I	2	2
	508641042	Meteorological Statistic	2	2
	508621081	Renewable Energy	2	
	508621062	Research Project I	2	
	508621071	English Language	1	
Fourth Year (Second Semester) 2024-2025	508642092	Precipitation Physics	2	2
	508642102	Air Pollution II	2	2
	508642122	Physics of the Ionosphere	2	
	508642082	Numerical Weather Prediction II	2	2
	508642112	Meteorological Data Analysis	2	2
	508622132	Environmental Disaster Management	2	

8. Expected Learning Outcomes of the Program

Knowledge

1. Keep up with advancements in atmospheric sciences.
2. Enhance students' ability to understand and recognize all areas related to atmospheric sciences.
3. Strengthen students' understanding of the atmosphere and explore the boundaries of atmospheric sciences through the use of innovative and modern educational methods.

Skills

1. Develop students' quantitative and scientific thinking skills applicable to atmospheric problems.
2. Equip students with fundamental skills to solve problems in atmospheric sciences and related fields by employing a scientific approach based on investigation, analysis, and deduction to reach objective solutions.
3. Enable students to demonstrate knowledge of scientific methods related to qualitative and quantitative analysis of atmospheric variables and develop basic analytical techniques to aid in understanding weather and climate.
4. Empower students to demonstrate knowledge of a wide range of meteorological phenomena and their roles in affecting weather and climate at local, regional, continental, and global levels.

Values

1. Develop students' abilities to understand fundamental principles in atmospheric sciences.
2. Enhance students' abilities to engage in dialogue, propose ideas, and accept others' opinions.
3. Foster students' scientific thinking skills.

9. Teaching and Learning Strategies

1. Provide detailed explanations of the scientific material to students.
2. Involve students in solving mathematical problems.
3. Engage in discussions and dialogue about the concepts related to the scientific material.

10. Assessment Methods

1. Homework assignments, weekly and monthly quizzes.
2. Scientific reports.
3. End-of-semester and end-of-year exams.
4. Defense of student graduation projects.

11. Teaching Staff

Teaching Staff Members						
Academic Rank	**Specialization**		**Requirements /Special Skills (if any)**		**Number of Teaching Staff**	
	General	**Specific**			**Personnel**	**Lecturer**
Assist. Prof. Dr. Asraa Khtan Abdulkareem	Atmospheric Sciences	Climate Systems			Personnel	Head of the Department
Prof. Dr. Monim Hakeem Khalaf	Atmospheric Sciences	Atmospheric Physics			Personnel	
Prof. Dr. Ali Mohammed Al-Salihi	Atmospheric Sciences	Atmospheric Physics			Personnel	
Prof. Dr. Ahmed Sami Hassan	Atmospheric Sciences	Climate Systems			Personnel	
Prof. Dr. Jasim Mohammed Rajab	Physics	Meteorology and Remote Sensing			Personnel	
Prof. Dr. Yaseen Kadhim Abbas	Atmospheric Sciences	Climate Systems			Personnel	
Prof. Dr. Osama Tareq Ahmed	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Prof. Dr. Alaa Mutar Shayia	Atmospheric Sciences	Climate Systems			Personnel	
Prof. Dr. Ahmed Fattah Hassoon	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Prof. Dr. Basim Ibraheem Wahab	Physics	Atmospheric Physics			Personnel	
Prof. Dr. Jasim Hameed Kadhum	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Assist. Prof. Dr. Husam Tareq Majeed	Atmospheric Sciences	Climate Systems			Personnel	
Assist. Prof. Dr. Thaer Obaid Roomi	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Assist. Prof. Dr. Iqbal Khalaf Khamees	Atmospheric Sciences	Climate Systems			Personnel	
Assist. Prof. Dr. Basim Abdulsada Mohammed	Atmospheric Sciences	Renewable Energy			Personnel	
Assist. Prof. Dr. Ali Jasim Mohammed	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Assist. Prof. Dr. Hussain Abodi Nemah	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Assist. Prof. Dr. Aqeel Ghazi Mutar	Atmospheric Sciences	Atmospheric Physics			Personnel	

Assist. Prof. Dr. Muthanna Abdulkareem Aziz	Atmospheric Sciences	Climate Systems			Personnel	
Assist. Prof. Dr. Munya Fadhil Jasim	Atmospheric Sciences	Atmospheric Physics			Personnel	
Assist. Prof. Dr. Ali Abed Atea	Atmospheric Sciences	Atmospheric Remote Sensing			Personnel	
Lect. Dr. Baidaa Jaafar Hassan	Atmospheric Sciences	Climate Systems			Personnel	
Lect. Dr. Sama Khalid Mohammed	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Lect. Dr. Haneen Hakem Abdulrada	Atmospheric Sciences	Climate Systems			Personnel	
Lect. Dr. Nadia Mohammed Abed	Atmospheric Sciences	Atmospheric Physics			Personnel	
Lect. Dr. Ali Raheem Tuaimah	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Lect. Dr. Samir Kassim Mohammed	Atmospheric Sciences	Climate Change			Personnel	
Lect. Dr. Dhuha Sabah Zaiter	Atmospheric Sciences	Climate Systems			Personnel	
Lect. Dr. Alaa Najim Abd	Atmospheric Sciences	Renewable Energy			Personnel	
Lect. Dr. Taghreed Ali Abbas	Atmospheric Sciences	Renewable Energy			Personnel	
Lect. Dr. Khawla Nihad Zeki	Atmospheric Sciences	Atmospheric Physics			Personnel	
Lect. Dr. Farah Hasseb Jasim	Atmospheric Sciences	Climate Systems			Personnel	
Lect. Dr. Imad Khraibet Rashid	Atmospheric Sciences	Atmospheric Physics			Personnel	
Assist. Prof. Hasanain Khaleel Abdullah	Atmospheric Sciences	Climate Systems			Personnel	
Assist. Prof. Zahraa Salah Mahdi	Atmospheric Sciences	Atmospheric Physics			Personnel	
Assist. Prof. Hind Saleem Ibrahim Harba	Computer Sciences	Artificial Intelligence			Personnel	
Assist. Prof. Mohammed Majeed Ahmed	Atmospheric Sciences	Atmospheric Physics			Personnel	
Lect. Ruaa Mazin Ibrahim	Atmospheric Sciences	Atmospheric Sciences			Personnel	
Lect. Nagham Abbas Mohammed	Atmospheric Sciences	Atmospheric Sciences			Personnel	
Lect. Osamah Basil Manji	Atmospheric Sciences	Hydrometeorology			Personnel	
Lect. Omar Laith Khaled	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Lect. Hadil Jalil Assi	Atmospheric Sciences	Atmospheric Sciences			Personnel	
Lect. Hasan Mahmood Azeez	Atmospheric Sciences	Atmospheric Physics			Personnel	
Lect. Wedyan Ghalib Nassif	Atmospheric Sciences	Hydrometeorology			Personnel	

Lect. Nagham Thare Ibraheem	Atmospheric Sciences	Atmospheric Physics			Personnel	
Lect. Sara Ali Mutar	Atmospheric Sciences	Climate Systems			Personnel	
Lect. Firas Sabeeh Basheer	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Lect. Luma Mahdi Matrood	Atmospheric Sciences	Climate Systems			Personnel	
Lect. Salwa Salman Naif	Atmospheric Sciences	Atmospheric Sciences			Personnel	
Lect. Sundus Hassan Jaber	Atmospheric Sciences	Atmospheric Dynamics			Personnel	
Lect. Shiemaa Auda Hashim	Atmospheric Sciences	Atmospheric Sciences			Personnel	
Lect. Zainab Majeed Abbood	Atmospheric Sciences	Atmospheric Physics			Personnel	
Lect. Yasmin Qusay Tawfeek	Atmospheric Sciences	Climate Systems			Personnel	
Lect. Dalya Akram Mahmood	Atmospheric Sciences	Atmospheric Physics			Personnel	
Assist. Lect. Salam Kulam Mohamed	Atmospheric Sciences	Hydrometeorology			Personnel	
Assist. Lect. Fadwa Sameer Abdul-Fatah	Atmospheric Sciences	Hydrometeorology			Personnel	
Assist. Lect. Zahraa Abudul-Razaq	Mathematics	Mathematics			Personnel	
Assist. Lect. Abdurrahman Mohammed Mahmood	Atmospheric Sciences	Meteorology / Atmospheric Sciences			Personnel	
Assist. Lect. Zahraa Arif Hussein	Atmospheric Sciences	Atmospheric Sciences			Personnel	
Assist. Lect. Zahraa Nasir Mohsen	Atmospheric Sciences	Atmospheric Sciences			Personnel	
Assist. Lect. Hala Ali Abed	Physics	Remote Sensing and Image Processing			Personnel	
Assist. Lect. Hind Kamil Kareem	Biology	Botany/Plant Physiology			Personnel	

Professional Development

Orientation of New Faculty Members

1. Continuous and accurate monitoring of the program.
2. Proposing new scientific ideas and participating in the development of the curriculum.

Professional Development for Faculty Members

1. Participation in courses, seminars, and scientific discussion sessions.
2. Keeping up with the latest scientific research in the field of specialization.
3. Conducting scientific visits to related government institutions and the private sector.

12. Admission Criteria

The department accepts graduates from the sixth preparatory year/scientific branch according to central admission standards, based on the total score and grade obtained by the student.

13. Major Sources of Information about the Program

1. Textbooks approved by the scientific committee in the department.
2. Supplementary books.
3. International books and sources (sources in English).
4. Additional sources from the internet.

14. Program Development Plan

1. Updating the curriculum by researching the latest accredited global sources.
2. Enhancing laboratories by updating scientific experiments and using the latest laboratory equipment.
3. Diversifying teaching methods through the use of modern educational tools and techniques.

Program Skills Framework															
				Learning Outcomes Required from the Program											
Year/ Level	Course Code	Course Name	Core or Elective	Knowledge				Skills				Values			
				a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	c4
Third Year (First Semester) 2024-2025	508631012	Weather Forecasting I	Core												
	508631062	Atmospheric Boundary Layer I	Core	√	√	√		√	√	√	√	√	√	√	
	508631072	Atmospheric Dynamics I	Core	√	√	√		√	√	√	√	√	√	√	
	508631022	Principles of Remote Sensing	Core	√	√	√		√	√	√		√	√	√	
	508631052	Climatology	Core	√	√	√		√	√	√	√	√	√	√	
	508631032	Complex Analysis	Core					√	√	√			√	√	
	508631042	Aviation Meteorology	Core	√	√	√		√	√	√	√	√	√	√	
Third Year (Second Semester) 2024-2025	508632092	Weather Forecasting II	Core	√	√	√		√	√	√	√	√	√	√	
	508632142	Atmospheric Boundary Layer II	Core	√	√	√		√	√	√	√	√	√	√	
	508632152	Atmospheric Dynamics II	Core	√	√	√		√	√	√	√	√	√	√	
	508632102	Remote Sensing of the Atmospheric	Core	√	√	√		√	√	√	√	√	√	√	
	508632132	Climate Changes	Core	√	√	√		√	√	√	√	√	√	√	
	508632112	Special Functions	Core					√	√	√			√	√	
	508632122	Biometeorology	Core	√		√		√	√				√	√	

	508631081	English Language	Core										√		
Fourth Year (First Semester) 2024-2025	508641022	Cloud Physics	Core	√	√	√		√	√	√	√	√	√	√	
	508641032	Air Pollution I	Core	√	√	√		√	√	√	√	√	√	√	
	508641052	Upper Atmospheric Layers	Core	√	√	√		√	√	√	√	√	√	√	
	508641012	Numerical Weather Prediction I	Core	√	√	√		√	√	√	√	√	√	√	
	508641042	Meteorological Statistic	Core	√	√	√		√	√	√		√	√	√	
	508621081	Renewable Energy	Core	√	√	√		√	√	√		√	√	√	
	508621062	Research Project I	Core	√	√	√		√	√	√	√	√	√	√	
	508621071	English Language	Core										√		
Fourth Year (Second Semester) 2024-2025	508642092	Precipitation Physics	Core	√	√	√		*	√	√	√	√	√	√	
	508642102	Air Pollution II	Core	√	√	√		√	√	√	√	√	√	√	
	508642122	Physics of the Ionosphere	Core	√	√	√		√	√	√	√	√	√	√	
	508642082	Numerical Weather Prediction II	Core	√	√	√		√	√	√	√	√	√	√	
	508642112	Meteorological Data Analysis	Core	√	√	√		√	√	√		√	√	√	
	508622132	Environmental Disaster Management	Core	√		√		√	√				√	√	

*Please mark the relevant boxes for the individual learning outcomes from the program subject to evaluation.

Course Description of
Third Year (First Semester)

1. Course Name	
Principles of Remote Sensing	
2. Course No.	
508631022	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Ali A. Attiya E-Mail: aliattiya@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objectives	This course provides an in-depth understanding of remote sensing principles and their application in satellite meteorology. Students will explore the fundamentals of remote sensing, satellite orbits, atmospheric radiation, and interactions of radiation with matter. The course will cover both passive and active remote sensing techniques, including radar and lidar.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introduction What is remote sensing, satellite meteorology, why remote sensing, people in remote sensing, active vs. passive remote sensing.	remote sensing	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

2	2	Satellite Orbits Newton's Laws of Motion, ewton's Law of Universal Gravitation, calculating satellite orbital parameters (assuming circular motion), Kepler's Laws,	Satellite Orbits	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
3	2	orientation of orbit in space, orbital parameters & orbit perturbation, Satellite positioning, tracking & navigation, orbits of meteorological satellites (MetSat).	Satellite Orbits	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
4	2	Atmospheric Radiation Nature of electromagnetic (EM) wave, quantitative description of radiation,	Atmospheric Radiation	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
5	2	Blackbody radiation, Planck's law, Wien's displacement law, brightness temperature, Kirchhoff's laws.	Atmospheric Radiation	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Interaction of Radiation with Matter I: atomic & molecular absorption (gas) Atomic & molecular absorption spectra, Absorption line shape, Atmospheric absorption spectra, Beer's law.	Interaction of Radiation with Matter I: atomic & molecular absorption (gas)	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
7	2	Interaction of Radiation with Matter II: macroscopic interaction with particulates (solid state) Dielectric materials, refractive index, particle absorption & scattering, Rayleigh scattering, Mie Scattering.	Interaction of Radiation with Matter II: macroscopic interaction with particulates (solid state)	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
8	2	Exam I	Monthly exam		Exam
9	2	Passive Remote Sensing I: Extinction and scattering Interaction of EM waves with matter, the radiative transfer equation, Beer's law & remote sensing of aerosol,	Passive Remote Sensing I: Extinction and scattering	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

10	2	remote sensing of ozone, Limb profiling by extinction, applications.	Passive Remote Sensing I: Extinction and scattering	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
11	2	Passive Remote Sensing II: Emission The radiative transfer equation, absorption-emission problem, principles of sounding by emission, sensing clouds by emission.	Passive Remote Sensing II: Emission	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	Active Remote Sensing I: Radar Radar Basics & Radar Equation,	Active Remote Sensing I: Radar	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
13	2	radar reflectivity & Precipitation, Radar Attenuation.	Active Remote Sensing I: Radar	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Active Remote Sensing II: Lidar Basics & lidar equation, lidar remote sensing.	Active Remote Sensing II: Lidar	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation

The total grading is 100%, divided as follows:

Monthly Exam	20 marks
Practical	12 marks
Quizzes and activities	8 marks
Final Exam	60 marks

12.Learning and Teaching Resources

Required Textbooks (curricular books, if any)	W. G. Rees, 2012: Physical Principles of Remote Sensing, 3rd Edition. Cambridge University Press, 492 p
Main References (sources)	**1.** Stanley Q. Kidder, 1995: Satellite Meteorology: An Introduction. Academic Press, 466 p. **2.** R R Kelkar, 2007: Satellite Meteorology. BS Publications, Hyderabad, India, 267 p. **3.** Shoichiro Fukao, Kyosuke Hamazu, and Richard Doviak, 2014: Radar for Meteorological and Atmospheric Observations. Springer, 537 p.

	4. Claus Weitkamp, 2005: Lidar: Range-Resolved Optical Remote Sensing of the Atmosphere. Springer, 456 p.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Principles of Remote Sensing Lab
1. Bending of Light
2. Calculate the index of refraction
3. Remote Atmosphere Sensitivity Laboratory Rayleigh scattering by water clouds
4. Exam I
5. Physics of Satellite Orbits
6. Using USGS Earth Explorer
7. Introduction to ENVI and Image Display
8. Exam II

1. Course Name	
Weather Forecasting I	
2. Course No.	
508631012	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
Weekly attendance	
5. Available Attendance Forms	
1/4/2025	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Aqeel Ghazi Mutar E- mail: mutaraqeel.atmsc@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objectives	By the end of this course, students will be able to understand the fundamentals of weather forecasting, analyze and interpret weather maps, utilize meteorological satellites, examine pressure systems and fronts, understand the movement of pressure systems, apply forecasting methods for pressure system movements, forecast the intensification of pressure systems, understand vorticity and circulation.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Outline of weather forecasting, types of forecasting, method of weather forecasting.	Introduction to Weather Forecasting	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
2	2	Types of weather maps, meteorological coordinates, gradients, slope and curvature of surface, the continuity of weather maps.	Weather maps	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
3	2	Meteorological satellite types and their properties, images	Forecasting Using Satellites I	Lectures, Laboratory	Quiz, assignment,

		and data obtained from meteorological satellites.		classes	Oral exam, report
4	2	Using meteorological satellites in weather forecasting.	Forecasting Using Satellites II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
5	2	Synoptic pressure systems, fronts & their types.	Pressure Systems and Fronts I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Pressure systems influence in Iraq weather.	Pressure Systems and Fronts II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
7	2	Moving systems of coordinate, digital representation of pressure systems.	Movement of Pressure Systems I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
8	2	Derive the velocity laws of pressure systems.	Movement of Pressure Systems II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
9	2	Exam I	Monthly exam		Exam
10	2	Extension method, the base of equal lines of the dual pressure conduct, the base of inclination axis.	Forecasting Methods in Pressure Systems Movement: part 1	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
11	2	The base of pressure lines equal of warm section, predicting in depressions center site (or heights) in Peterson method, the base of oriented stream.	Forecasting Methods in Pressure Systems Movement: part 2	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	Intensity of pressure systems, vertical composition of ideal front, forecasting in intensity of front decline by terms of meteorological variables.	Forecasting in Intensification of Pressure System	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
13	2	Vorticity motion, absolute vorticity, relationship between rotation and circulation motion, relationship between circulation and vorticity motion.	Vorticity and Circulation	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Exam II	Monthly exam		Exam
15	2	Review			

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	
Main References (sources)	
Recommended books and references (scientific journals, reports, …)	[1]: S. Petterssen, 1956: Weather Analysis and Forecasting, VOL.1, Textbook on Synoptic and weather forecasting. [2]: E. Martin.,2006, Midlatitude Atmospheric Dynamics, Textbook on Synoptic and dynamic Meteorology. [3]: Rolnad Stull.,2017, Practical Meteorology Textbook on Synoptic on atmospheric science.
Electronic references, Websites	

Course Description Template

Course Name
Weather Forecasting I Lab
1. Identify the Jet Stream and Unstable Atmospheric Region.
2. Thickness Maps 1.
3. Thickness Maps 2.
4. Finding Trough, Ridge.
5. Exam I
6. The Relative Vorticity.
7. Fronts.
8. mid-latitude depression evolution1.
9. mid-latitude depression evolution2.
10. Exam II

1. Course Name	
Atmospheric Boundary Layer I	
2. Course No.	
508631062	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Assist. Prof. Dr. Basim Abdulsada Mohammed E-Mail: *basim.a.s@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	The (ABL) experiences a diurnal (daily) cycle of temperature, humidity, wind, and pollution variations in response to the varying surface fluxes. Turbulence is ubiquitous in the (ABL) and is one of the causes of the unique nature of the (ABL). Through a combination of theoretical principles and practical applications, students will understand micrometeorology, and turbulence dynamics, characterize turbulent flow, and assess surface roughness, the interactions between the earth's surface and the atmosphere's, logarithmic sublayer and wind profiles.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Micrometeorology, history of ABL, characteristic of ABL.	Atmospheric boundary Layer (ABL) I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
2	2	Important and Applications of micrometeorology.	Atmospheric Boundary Layer (ABL) II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

3	2	Local static stability, nonlocal static stability, convection.	Why is the Boundary Layer Turbulent? I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
4	2	Dynamic stability, kelvin-Helmholtz instability, shear instability.	Why is the Boundary Layer Turbulent? II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
5	2	Description of Turbulence, Turbulent Energy Cascade.	Turbulent Flow I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Mean and turbulent parts, variance and standard deviation, isotropy.	Turbulent Flow II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
7	2	Flux, kinematic flux, Turbulent Energy Equation.	Turbulent Fluxes and TKE Budgets I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
8	2	Turbulent kinetic energy budget, terms of TKE budget equation.	Turbulent Fluxes and TKE Budgets II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
9	2	Exam I	Monthly exam		Exam
10	2	Turbulence Closure, turbulent closure types, k-theory.	Boundary Layer Turbulence and Mean Wind Profiles I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
11	2	Wind profile evolution, typical boundary layer profiles.	Boundary Layer Turbulence and Mean Wind Profiles II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	Drag and stress, friction velocity, roughness length	Surface Roughness	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
13	2	logarithmic sublayer in neutral condition, logarithmic profile in stable layer, profile in convective radix layer	Logarithmic Sublayer	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Review and Exercise Solution	Review and Exercise Solution	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Roland B. Stull, 1988: An Introduction to Boundary Layer Meteorology. Springer (reprint 2003), 670 p.
Main References (sources)	**[1]:** S. Pal Arya, 2001: Introduction to Micrometeorology, Second Edition. Academic Press, 420 p. **[2]:** Thomas Foken and Carmen J. Nappo, 2008: Micrometeorology. Springer, 308 p.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Atmospheric Boundary Layer I Lab
1. The vertical structure of BL by using drawing potential temperature profile
2. The vertical structure of BL by using drawing potential temperature profile
3. Discussion the results
4. Estimation of fraction velocity (u_*).
5. Discussion the results
6. Exam I
7. Calculation drag coefficient of surface (C_D) by using formotric methods.
8. Discussion the results
9. Calculation of turbulent intensity of horizontal wind speed.
10. Discussion the results
11. Finding atmospheric stability categories by using Basiquil method.
12. Discussion the results
13. Exam II

1. Course Name	
Atmospheric Dynamics I	
2. Course No.	
508631072	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 / 2 (Theory (2 hr. in the week)	
7. Course administrator's name (mention all if more than one name)	
Assist. Prof. Dr. Ali Jasim Mohammed E-Mail: *Ali.alhafiz.atmsc@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	The course provides an introduction to the dynamics of the atmosphere, the fundamental forces. Also provides the equations of atmospheric motion. Major course topics include basic dynamics (e.g., Geostrophic flow, Gradient flow, Inertial and cyclostrophic flow). This course aims to build a fundamental set of physical principles and apply them to understand large-scale atmospheric motions. Mathematical descriptions of the atmospheric dynamics are constructed and interpreted in terms of their physical significance.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Vectors, components, dot product, cross product, derivatives of vectors.	Vectors and Vector Calculus I	Lecture class	Quiz, assignment, report
2	2	The gradient, divergence, curl, the Laplacian, the del operator.	Vectors and Vector Calculus II	Lecture class	Quiz, assignment, report
3	2	Units, coordinates and velocity, forces, the pressure gradient force, the gravitational force,	Fundamental Forces I	Lecture class	Quiz, assignment, report

		viscous force, rotating reference frames.			
4	2	Mathematical development of apparent forces, the Coriolis force, centrifugal force and gravity, geopotential, the momentum equation	Fundamental Forces II	Lecture class	Quiz, assignment, report
5	2	The hydrostatic equation, pressure decrease in an isothermal atmosphere, density profile.	Pressure I	Lecture class	Quiz, assignment, report
6	2	Thickness and the hypsometric equation, pressure coordinates.	Pressure II	Lecture class	Quiz, assignment, report
7	2	The total derivative, advection of a scalar versus a vector, more on advection, advection of momentum and the curvature terms, vector form vs. component form of momentum equation.	The Total Derivative	Lecture class	Quiz, assignment, report
8	2	Exam I	Monthly exam		Exam
9	2	Scale analysis of the horizontal momentum equations, the Rossby number and geostrophic.	Scale Analysis I	Lecture class	Quiz, assignment, report
10	2	Cyclostrophic, and gradient balance, more on the geostrophic wind, the ageostrophic wind, scale analysis of the vertical momentum equation.	Scale Analysis II	Lecture class	Quiz, assignment, report
11	2	Eulerian derivation of the continuity equation, a Lagrangian derivation of the continuity equation, incompressible and anelastic continuity equations.	The Continuity and Additional Equations I	Lecture class	Quiz, assignment, report
12	2	Thermodynamic energy equation, the equation of state, the governing equations	The Continuity and Additional Equations II	Lecture class	Quiz, assignment, report
13	2	natural coordinates, geostrophic flow, inertial flow, cyclostrophic flow, gradient flow, trajectories vs. streamlines	Balanced Flow	Lecture class	Quiz, assignment, report
14	2	Review	Review	Lecture class	

15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Quizzes and activities 10 marks Final Exam 70 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	James R. Holton and Gregory J. Hakim, 2012: An Introduction to Dynamic Meteorology, Fifth Edition. Academic Press, 552 p.
Main References (sources)	[1]: Mankin Mak, 2011: Atmospheric Dynamics. Cambridge University Press, 500 p. [2]: Gary Lackmann, 2012: Midlatitude Synoptic Meteorology: Dynamics, Analysis, and Forecasting. American Meteorological Society, 345 p.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

1. Course Name	
Climatology	
2. Course No.	
508631052	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30/ 2 (Theory (2 hr. in week),	
7. Course administrator's name (mention all if more than one name)	
Dr. Samir Kassim Mohammed E-Mail: *samirkassim @uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	The course is aimed at providing an introduction to the physical processes underlying atmospheric and weather phenomena, including the climate system 1 - Climatology continues to lead as the most comprehensive presentation of our dynamic climate system. 2 - The full comprehension of its processes that enhances clarity and gradation of all maps, climatology -graphs, and images to help readers better understand the diversity of climate within varying climate types. 3 - The Couse appeals to all students, as it covers the basics of atmospheric science in the early chapters and provides the breadth and depth of topics to challenge the more experienced reader. 4 - Climatology and its application aims to improve students' communication skills, encourage critical-thinking, and invoke a sense of social responsibility, making it the clear choice in this rapidly developing science
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	Description of the climate system and its components	Introduction to climatology	Lectures,	Quiz, assignment, Oral exam, report
2	2	The Atmosphere Composition and temperature	Introduction to climatology	Lectures,	Quiz, assignment, Oral exam, report
3	2	Atmosphere and Hydrosphere	Introduction to climatology	Lectures,	Quiz, assignment, Oral exam, report
4	2	Cryosphere and Land surface (lithosphere)	Principles of climatology	Lectures,	Quiz, assignment, Oral exam, report
5	2	Energy exchange near surface	Principles of climatology	Lectures,	Quiz, assignment, Oral exam, report
6	2	Global hydrology and water balance	Principles of climatology	Lectures,	Quiz, assignment, Oral exam, report
7	2	Climate and General Circulation	Principles of climatology	Lectures,	Quiz, assignment, Oral exam, report
8	2	Climate classification	Principles of climatology	Lectures,	Quiz, assignment, Oral exam, report
9	2	Exam I	Monthly exam		Exam
10	2	Applied of climatology	Climate System	Lectures,	Quiz, assignment, Oral exam, report
11	2	Climate impacts	Climate System	Lectures,	Quiz, assignment, Oral exam, report
12	2	Climatic Data (used, analysis, and assimilation)	Climate System	Lectures,	Quiz, assignment, Oral exam, report

13	2	Climate feedbacks	Climate System	Lectures,	Quiz, assignment, Oral exam, report
14	2	Action of climate as part sustainability	Climate System	Lectures,	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Quizzes and activities 10 marks Final Exam 70 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	**[1]:** Roger G. Barry and Eileen A. Hall-McKim, 2014: Essentials of the Earth's Climate System. Cambridge University Press, 270 p.
Main References (sources)	**[2]:** F. W. Taylo, 2005: Elementary Climate Physics. Oxford University Press, 232 p. **[3]:** Raymond T. Pierrehumbert, 2011: Principles of Planetary Climate. Cambridge University Press, 640 p.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

1. Course Name	
Aviation Meteorology	
2. Course No.	
508631042	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30/ 2 (Theory 2 hr. in week)	
7. Course administrator's name (mention all if more than one name)	
Dr. Iqbal Khalaf Khames E-Mail: *iqbal.atmsc @uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	This course will help the students to explore the forces acting on an airplane, including weight, lift, thrust, and drag. Through a combination of theoretical analysis and practical examples, the course will cover essential concepts such as the lift and drag equations, the effects of wing design on aerodynamic performance, and the impact of air properties and velocity on aerodynamic forces
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	Explain the basic principles of aerodynamic, Describe how airflow over an airfoil lift	Force on airplane	Lectures classes	Quiz, assignment, Oral exam, report
2	2	Define weight as a force due to gravity action on a mass, Differentiate between weight and mass. Weight Equation: Write and explain the weight equation: $W = mg$, Understand the units	Weight, the weight equation	Lectures classes	Quiz, assignment, Oral exam, report

		of measurement for each variable of weight equation			
3	2	Define lift force as the upward force that opposes the weight of an aircraft and enables it to stay in the air, Explain the basic principles of lift, including Bernoulli's principle and Newton's third law of motion Lift Equation: Write and explain the lift equation: $L = \frac{1}{2}\ \rho V^2\ SC_L$	Lift, no fluid, no lift, no motion, no lift the lift equation, the lift coefficient	Lectures classes	Quiz, assignment, Oral exam, report
4	2	Define angle of attack as the angle between the chord line of the wing and the direction of the oncoming airflow	Inclination effects of lift	Lectures classes	Quiz, assignment, Oral exam, report
5	2	Explain the basic principles of aerodynamics and how the shape of the shape of the wing affects air flow	Why does a wing have a rounded front? -why does a wing have a sharp rear edge? how does tilting a wing affect the air flowing over it?	Lectures classes	Quiz, assignment, Oral exam, report
6	2	Understand and apply Newton's third law of motion in context of thrust generation, thrust equation: $T = M.(V_e - V_0)$	Thrust force, the thrust equation	Lectures classes	Quiz, assignment, Oral exam, report
7	2	Explain what drag is and its significance in fluid dynamic and vehicle. the drag equation: $D = \frac{1}{2}\ \rho V^2\ AC_d$	Drag force, the drag equation	Lectures classes	Quiz, assignment, Oral exam, report
8	2	Exam I	Monthly exam		Exam
9	2	Define drag and its significance in various fields such as aerodynamics, fluid dynamics, and engineering	Factors that affect drag	Lectures classes	Quiz, assignment, Oral exam, report
10	2	Define key concepts such as air pressure, temperature density and how they interrelate to influence air motion	Motion of the Air	Lectures classes	Quiz, assignment, Oral exam, report
11	2	Provide students with a fundamental understanding of the physical and chemical characteristics of the atmosphere	Properties of the Air	Lectures classes	Quiz, assignment, Oral exam, report

12	2	Provide students with an in-depth Understanding of ow changes in velocity influence the behavior of objects moving through air	Velocity effects on aerodynamic forces	Lectures classes	Quiz, assignment, Oral exam, report
13	2	Provide students with a thorough understanding of the principles behind lift generation and the factors influencing the lift coefficient	Lift and Lift Coefficient	Lectures classes	Quiz, assignment, Oral exam, report
14	2	Define wind shear and distinguish between its types (horizontal and vertical)	Wind Shear	Lectures classes	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Quizzes and activities 10 marks Final Exam 70 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Federal Aviation Administration. (2009). Pilot's handbook of aeronautical knowledge. Skyhorse Publishing Inc.
Main References (sources)	**[1]:** Lester, P. F. (1995). Aviation weather. **[2]:** United States. Federal Aviation Administration. (1971). Instrument Flying Handbook. Department of Transportation
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

1. Course Name	
Complex Analysis	
2. Course No.	
508631032	
3. Semester and Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 / 2 (Theory (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Ali Abdul Rasool E-Mail: *aaabdulhussein@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objective	This course provides a comprehensive study of advanced mathematical concepts such as complex numbers and hyperbolic functions, series and limits, partial differentiation, multiple integrals, matrices and vector areas.
9. Teaching and Learning Strategies	
strategy	Lectures Oral discussion Contests Reports

10. Course structure

week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning method	Evaluation method
1	2	The need for complex numbers, manipulation of complex numbers, polar representation of complex numbers.	Complex Numbers and Hyperbolic Functions	Lectures & Classrooms	Test, task, oral exam.
2	2	De Moivre's theorem, complex logarithms and complex forces, applications to differentiation and integration, hyperbolic functions.	Complex forces	Lectures & Classrooms	Test, task, oral exam.
3	2	The chain, the summary of the series, the convergence of the infinite series.	String and Borders	Lectures & Classrooms	Test, task, oral exam.

4	2	Operations with series, power chain, energy chain convergence; operations with power chain, Taylor chain, boundary assessment.	Processes with a series	Lectures & Classrooms	Test, task, oral exam.
5	2	Partial differentiation Partial derivative, total differentiation and total derivative, useful theorems of partial differentiation, chain rule, variables change.	Partial differentiation	Lectures & Classrooms	Test, task, oral exam.
6	2	Taylor's theorem for multivariate functions, constant values for multivariate functions.	Taylor's theorem	Lectures & Classrooms	Test, task, oral exam.
7	2	Constant values under constraints, envelopes, thermodynamic relationships, differentiation of integrals.	Constant values	Lectures & Classrooms	Test, task, oral exam.
8	2	Exam I	Monthly exam		Exam
9	2	Multiple integrations Dual integrals, triple integrals, applications of multiple integrals, variables change in multiple integrals.	Multiple integrations	Lectures & Classrooms	Test, task, oral exam.
10	2	Matrices and vector areas Area of vectors, base vectors, inner product, some useful inequalities, linear operators, matrices.	Matrices and vector areas	Lectures & Classrooms	Test, task, oral exam.
11	2	Basic matrix algebra, functions of matrices.	Matrices and vector areas	Lectures & Classrooms	Test, task, oral exam.
12	2	Switch the matrix.	Matrices and vector areas	Lectures & Classrooms	Test, task, oral exam.
13	2	Complex and hermit coupling the matrix.	Matrices and vector areas	Lectures & Classrooms	Test, task, oral exam.
14	2	Full review	Full review	Lectures & Classrooms	Test, task, oral exam.
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation

The total score is 100%, divided as follows:

Monthly exam 20 marks
Tests and Activities 10 Signs
Final exam 70 marks

12.Learning and Teaching Resources	
Textbooks required (curriculum books if applicable)	K.F. Riley, M.P. Hobson, and S. J. Bench, 2006: Mathematical Methods, for Physics and Geometry, 3rd ed., by Cambridge University Press, 1359 pp.
Main references (sources)	
Recommended books and references (scientific journals, reports, ...)	Introduction to Composite Analysis by Ravi B. Agarwal, Kanishka Pereira , Sandra Penellas
Websites, Websites	https://www.uomustansiriyah.edu.iq/e-learn/profile.php?id=3980

Course Description of
Third Year (Second Semester)

1. Course Name	
Remote Sensing of The Atmosphere	
2. Course No.	
508632102	
3. Semester & Year	
Second Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Ali A. Attiya E-Mail: aliattiya@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objectives	This course provides an in-depth exploration of meteorological satellites and remote sensing technologies used in weather analysis and forecasting. Students will learn about operational and experimental meteorological satellites, their orbits, instruments, and data interpretation techniques. Emphasis will be placed on understanding the capabilities and applications of various satellite sensors in visible, infrared (IR), and microwave channels. Additionally, students will gain practical skills in interpreting satellite imagery to identify different types of weather systems, clouds, and atmospheric constituents.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Operational vs. experimental, operational satellites, polar orbiting satellites, and geostationary,	Meteorological Satellite	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

2	2	some examples of experimental satellites sensing, active vs. passive remote sensing.	Meteorological Satellite	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
3	2	MODIS (Moderate-Resolution Imaging Spectroradiometer), AIRS (Atmospheric Infrared Sounder),	Instrument of Meteorological Satellite	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
4	2	TRMM (Tropical Rainfall Measuring Mission), CloudSat, CALIPSO (Cloud-Aerosol Lidar & Infrared Pathfinder Satellite Observations),	Instrument of Meteorological Satellite	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
5	2	Visible channels, visible image interpretation, IR channels, IR image interpretation,	Operational Remote Sensing in Visible, IR, and Microwave Channels	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	IR water vapor channels, water vapor image interpretation, visible remote sensors, IR remote sensors, microwave remote sensing, satellite imagery and sounders.	Operational Remote Sensing in Visible, IR, and Microwave Channels	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
7	2	Distinguishing Different Image Types. Identifying Weather Systems.	Satellite Imagery Interpretation I: Image Types and Weather Systems	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
8	2	Exam I	Monthly exam		Exam
9	2	Basic cloud types, cloud on metsat imagery,	Satellite Imagery Interpretation II: Identifying Clouds	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
10	2	Mesoscale convective system.	Satellite Imagery Interpretation II: Identifying Clouds	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
11	2	EUMETSAT MeteoSat I: Applications for Weather Analysis and Forecasting	EUMETSAT MeteoSat I:	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	Synoptic scale cloud, mesoscale cloud, fog, orographic cloud, tropical cyclones.	EUMETSAT MeteoSat I:	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
13	2	Atmospheric Constituents	EUMETSAT MeteoSat II:	Lectures, Laboratory classes	Quiz, assignment,

					Oral exam, report
14	2	Water vapor, dust and aerosols, dust storms, volcanic ash plume, fire, smoke	EUMETSAT MeteoSat II:	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	W. G. Rees, 2012: Physical Principles of Remote Sensing, 3rd Edition. Cambridge University Press, 492 p
Main References (sources)	**1.** Stanley Q. Kidder, 1995: Satellite Meteorology: An Introduction. Academic Press, 466 p. **2.** R R Kelkar, 2007: Satellite Meteorology. BS Publications, Hyderabad, India, 267 p. **3.** Shoichiro Fukao, Kyosuke Hamazu, and Richard Doviak, 2014: Radar for Meteorological and Atmospheric Observations. Springer, 537 p. **4.** Claus Weitkamp, 2005: Lidar: Range-Resolved Optical Remote Sensing of the Atmosphere. Springer, 456 p.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Remote Sensing of The Atmosphere Lab
1. Introduction to the program
2. Add Data
3. Tool bar
4. Exam I
5. Data Sources
6. Geo-referencing
7. Geodatabase Interpolation (SHP)-Excel
8. Exam II

1. Course Name	
Weather Forecasting II	
2. Course No.	
508632092	
3. Semester & Year	
Second Semester, (2024 / 2025)	
4. Available Attendance Forms	
1/4/2025	
5. Date of Description Preparation	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Aqeel Ghazi Mutar E-Mail: mutaraqeel.atmsc@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objectives	By the end of this course, students will be able to utilize vorticity concepts in weather prediction models, explain the role of long waves in weather forecasting, determine vertical motion through various atmospheric determinants, calculate vertical motion both dynamically and adiabatically, derive the thermal geostrophic wind equation and the thickness equation, apply practical formulas for thermal geostrophic wind calculations, understand the dynamics of front gradients in weather forecasting.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	Definition of Rossby index (parameter), the relation between Rossby parameter and vorticity, driving Rossby index from absolute vorticity.	Forecasting by Vorticity I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
2	2	Deriving Rossby index from absolute vorticity.	Forecasting by Vorticity II	Lectures, Laboratory classes	Quiz, assignment,

					Oral exam, report
3	2	What are the long waves, characteristics of long waves, methods of determining the long waves.	Forecasting by Long Waves: Part 1	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
4	2	The importance of long waves, driving the velocity of long waves, the proprieties of Rossby waves.	Forecasting by Long waves: Part 2	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
5	2	Vertical wind motion, the reasons of generation vertical motion and development, determinants of vertical motion Account.	Forecasting by Vertical Motion: Part 1	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Calculate the vertical motion dynamically & adiabatically, the relationship of divergence (or convergence) in vertical motion, predicting by using the vertical motion.	Forecasting by Vertical Motion: Part 2	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
7	2	Exam I	Monthly exam		Exam
8	2	Geostrophic wind definition, thermal wind definition, thermal geostrophic wind equation.	Geostrophic and Thermal Wind I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
9	2	The importance of thermal wind, thickness equation.	Geostrophic and Thermal Wind II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
10	2	The determinants of using thermal wind equation.	Forecasting by Thermal Wind I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
11	2	Practical formulas to the thermal geostrophic wind, Predicting using the thermal wind.	Forecasting by Thermal Wind II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	What is fronts equilibrium, the relationship between pressure gradient and front gradient.	Fronts Equilibrium: Part 1	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
13	2	The relationship between front gradient and the geostrophic wind, the relationship between front gradient and temperature.	Fronts Equilibrium: Part 2	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Exam II	Monthly exam		Exam
15	2	Review			

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	
Main References (sources)	
Recommended books and references (scientific journals, reports, …)	[1]: S. Petterssen, 1956: Weather Analysis and Forecasting, VOL.1, Textbook on Synoptic and weather forecasting. [2]: E. Martin.,2006, Midlatitude Atmospheric Dynamics, Textbook on Synoptic and dynamic Meteorology. [3]: Rolnad Stull.,2017, Practical Meteorology Textbook on Synoptic on atmospheric science.
Electronic references, Websites	

Course Description Template

Course Name
Weather Forecasting II Lab
1. Lifting Condensation Level (LCL)1.
2. Lifting Condensation Level (LCL)2
3. Level of Free Convection (LFC) and Equilibrium Level (EL)1.
4. Level of Free Convection (LFC) and Equilibrium Level (EL)2.
5. Exam I
6. Convective Available Potential Energy (CAPE)1.
7. Convective Available Potential Energy (CAPE)2.
8. Long Wave part 1.
9. Long Wave part 2.
10. Exam II

1. Course Name	
Atmospheric Boundary Layer II	
2. Course No.	
508632142	
3. Semester & Year	
Second Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Assist. Prof. Dr. Basim Abdulsada Mohammed E-Mail: *basim.a.s@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	The (ABL) experiences a diurnal (daily) cycle of temperature, humidity, wind, and pollution variations in response to the varying surface fluxes. Turbulence is ubiquitous in the (ABL) and is one of the causes of the unique nature of the (ABL). Through a combination of theoretical principles and practical applications, students will understand micrometeorology, and turbulence dynamics, characterize turbulent flow, and assess surface roughness, the interactions between the earth's surface and the atmosphere's, logarithmic sublayer and wind profiles.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Buckingham pi dimensionless analysis, Stability parameter, turbulent Prandtl number	Monin-Obukhov Similarity Theory I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
2	2	Similarity theory, monin-Obukhov similarity theory, Obukhov length, similarity function relations.	Monin-Obukhov Similarity Theory II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

3	2	Introduction, Net radiation at the surface, Soil temperatures and heat flux.	Surface Energy Balance	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
4	2	Introduction, Evaporation from dry vegetation, Soil moisture	Surface Evaporation	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
5	2	Eddy-Covariance Method, Profile Method.	Experimental Methods for Estimating the Fluxes of Energy and Matter I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Flux-Variance Methods, Accumulation Methods, Fluxes of Chemical Substances.	Experimental Methods for Estimating the Fluxes of Energy and Matter II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
7	2	Morning growth of the boundary layer, The nocturnal jet.	The Diurnal Cycle and the Nocturnal BL	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
8	2	Introduction, An idealized NBL model.	The Stable BL	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
9	2	Exam I	Monthly exam		Exam
10	2	Profile Shapes, Evolution, Thermal Structures.	The Mixed Layer I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
11	2	Horizontal Roll Vortices and Mesoscale Cellular Convection, Dispersion.	The Mixed Layer II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	Characteristics, Evolution and Models, Overshooting and Intermittency.	The Entrainment Zone	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
13	2	Exercise Solution	Exercise Solution	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Review	Review	Lectures, Laboratory classes	
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Roland B. Stull, 1988: An Introduction to Boundary Layer Meteorology. Springer (reprint 2003), 670 p.
Main References (sources)	**[1]:** S. Pal Arya, 2001: Introduction to Micrometeorology, Second Edition. Academic Press, 420 p. **[2]:** Thomas Foken and Carmen J. Nappo, 2008: Micrometeorology. Springer, 308 p.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Atmospheric Boundary Layer II Lab
1. Calculation of Zero displacement length (Z_d) by using Bottema formula
2. Discussion the results.
3. Calculation of surface roughness length by using Bottema formula
4. Discussion the results.
5. Calculation the function of roughness and stability (p) in neutral conditions
6. Discussion the results.
7. Exam I
8. Vertical movement eddy heat flux.
9. Discussion the results.
10. Calculation of turbulent kinetic energy (TKE).
11. Discussion the results.
12. Exam II

1. Course Name	
Atmospheric Dynamics II	
2. Course No.	
508632152	
3. Semester & Year	
Second Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 / 2 (Theory (2 hr. in the week)	
7. Course administrator's name (mention all if more than one name)	
Assist. Prof. Dr. Ali Jasim Mohammed E-Mail: *Ali.alhafiz.atmsc@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	The course provides an extra subject on atmospheric dynamics that completes the theoretical topics of the first course, including basic dynamics (thermal wind, vertical motion, circulation and vorticity), and understand the types of winds and the momentum equations in the pressure coordinates, circulation, vorticity and some other subjects.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Thermal wind, physical explanation of thermal wind.	Thermal Wind I	Lecture class	Quiz, assignment, report
2	2	Backing and veering winds.	Thermal Wind II	Lecture class	Quiz, assignment, report
3	2	Pressure coordinates, momentum equations in pressure coordinates, continuity equation in pressure coordinates.	Vertical Motion I	Lecture class	Quiz, assignment, report

4	2	Thermodynamic energy equation in pressure coordinates, pressure tendency equation.	Vertical Motion II	Lecture class	Quiz, assignment, report
5	2	Barotropic and baroclinic fluids.	Circulation I	Lecture class	Quiz, assignment, report
6	2	Circulation, circulation in a barotropic fluid, circulation in a baroclinic fluid, circulation on a rotating earth.	Circulation II	Lecture class	Quiz, assignment, report
7	2	Exam I	Monthly exam		Exam
8	2	Vorticity, vortex stretching.	Vorticity I	Lecture class	Quiz, assignment, report
9	2	Relative versus absolute vorticity, curvature versus shear, geostrophic vorticity.	Vorticity II	Lecture class	Quiz, assignment, report
10	2	Derivation of the vorticity equation, physical meaning of the terms in the vorticity equation.	The Vorticity Equation I	Lecture class	Quiz, assignment, report
11	2	The vorticity equation on the synoptic scale, the quasi-geostrophic approximation.	The Vorticity Equation II	Lecture class	Quiz, assignment, report
12	2	The barotropic quasi-geostrophic vorticity equation, potential vorticity in a barotropic fluid.	Potential Vorticity I	Lecture class	Quiz, assignment, report
13	2	Potential vorticity in a baroclinic fluid, potential vorticity and the generation of lee-side troughs	Potential Vorticity II	Lecture class	Quiz, assignment, report
14	2	Review	Review	Lecture class	
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation

The total grading is 100%, divided as follows:

Monthly Exam 20 marks
Quizzes and activities 10 marks
Final Exam 70 marks

12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	James R. Holton and Gregory J. Hakim, 2012: An Introduction to Dynamic Meteorology, Fifth Edition. Academic Press, 552 p.
Main References (sources)	[1]: Mankin Mak, 2011: Atmospheric Dynamics. Cambridge University Press, 500 p. [2]: Gary Lackmann, 2012: Midlatitude Synoptic Meteorology: Dynamics, Analysis, and Forecasting. American Meteorological Society, 345 p.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

1. Course Name	
Climate Change	
2. Course No.	
50863213	
3. Semester & Year	
Second Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 / 2 (Theory (2 hr. in the week)	
7. Course administrator's name (mention all if more than one name)	
Dr. Ali Raheem Tuaimah , E-Mail: aliraheem@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objectives	This course presents an introduction to climate change and its effects on human life, what are the reasons and results of climate change, and how it can be mitigated and adapted. And in the end of this course, students should be able to understand the reasons behind climate change, and how the adaptation to climate change will reduce the risk, strengthen resilience, enhance well-being, and have the capacity to anticipate and respond successfully to climate change.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	General considerations.	Climate Change	Lecture class	Quiz, assignment, Oral exam, report
2	2	Impacts of climate change	Climate forcing	Lecture class	Quiz, assignment, Oral exam, report
3	2	Climate feedback, Climate response.	Feedback and response	Lecture class	Quiz, assignment,

					Oral exam, report
4	2	The geological record, The last glacial cycle, and post-glacial conditions, The past 1000 years.	The Climatic Record	Lecture class	Quiz, assignment, Oral exam, report
5	2	Circulation changes, Solar variability.	Understanding Recent Climatic Change I	Lecture class	Quiz, assignment, Oral exam, report
6	2	Volcanic activity, Anthropogenic factors.	Understanding Recent Climatic Change II	Lecture class	Quiz, assignment, Oral exam, report
7	2	The South Asian monsoon, East Asian and Australian summer monsoons.	Tropical Climate I	Lecture class	Quiz, assignment, Oral exam, report
8	2	El Niño–Southern Oscillation (ENSO) events.	Tropical Climate II	Lecture class	Quiz, assignment, Oral exam, report
9	2	Exam I	Monthly exam		Exam
10	2	Basics for modeling.	Modeling Climate Changes I	Lecture class	Quiz, assignment, Oral exam, report
11	2	Climate models.	Modelling Climate Changes II	Lecture class	Quiz, assignment, Oral exam, report
12	2	Simulations of future climates.	Modelling Climate Changes III	Lecture class	Quiz, assignment, Oral exam, report
13	2	Mitigation, Adaptation.	Climate Change Governance	Lecture class	Quiz, assignment, Oral exam, report
14	2	Review	Review	Lecture class	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Quizzes and activities 10 marks Final Exam 70 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	David Archer, 2011: Global Warming: Understanding the Forecast, 2nd Edition. Wiley, 212 p.
Main References (sources)	John Houghton, 2009: Global Warming: The Complete Briefing, 4th Edition. Cambridge University Press, 454 p.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

1. Course Name	
Biometeorology	
2. Course No.	
508632122	
3. Semester & Year	
Sconed Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30/ 2 (Theory 2 hr. in week)	
7. Course administrator's name (mention all if more than one name)	
Dr. Iqbal Khalaf Khames E-Mail: iqbal.atmsc @uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objectives	This course introduces students to the principles, methods, and applications of biometeorology to understand and predict the impacts of weather and climate on living organisms. The course provides an exploration of the interactions between the atmospheric environment and human health, focusing on the principles of human biometeorology. Students will gain a deep understanding of how various environmental factors influence human well-being and how to assess and manage the impact of these factors.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	Comprehend the basic principles of biometeorology and its significance – understand the interactions between atmospheric processes and biological systems	Introduction	Lectures classes	Quiz, assignment, Oral exam, report
2	2	Students should be able to explain the fundamental	Human biometeorology	Lectures classes	Quiz, assignment,

		principles of human biometeorology, including how meteorological factors affect human and behaviour.			Oral exam, report
3	2	Students should be able to describe the fundamental processes governing the atmosphere, including, cloud formation and precipitation	Atmospheric environment	Lectures classes	Quiz, assignment, Oral exam, report
4	2	Explain the basic principles of thermal processes, including heat transfer mechanisms (conduction, convection and radiation) and their effect on the environment	Thermal environment	Lectures classes	Quiz, assignment, Oral exam, report
5	2	Explain the concepts and definitions of key thermal indices, including heat index, net effective temperature and wind chill	Thermal indices heat index, net effective temperature, wind chill	Lectures classes	Quiz, assignment, Oral exam, report
6	2	Explain the purpose and significance of bio-climate maps in depicting the relationships between climatic factors and biological systems	Bio-climate maps (meso– and macro scale)	Lectures classes	Quiz, assignment, Oral exam, report
7	2	Explain the principles of health resort climatology, including how climatic factors are utilized to promote health and well-being in resort settings	Health resort climatology	Lectures classes	Quiz, assignment, Oral exam, report
8	2	Exam I	Monthly exam		Exam
9	2	Explain the basic principles of radiation, including the different types of radiation (e.g. Electromagnetic, particle) and their properties	Radiation	Lectures classes	Quiz, assignment, Oral exam, report
10	2	Explain what the UV index is including its purpose, scale and how it is calculated	UV-index, UV-index in Europe	Lectures classes	Quiz, assignment, Oral exam, report
11	2	Explain the principles of air quality management, including the identification and control of air quality standards and regulation	Air quality management and allergenic pollen	Lectures classes	Quiz, assignment, Oral exam, report
12	2	Explain the importance of air quality for health resorts and	Air quality in health resorts, allergenic pollen grains	Lectures classes	Quiz, assignment,

		how affects guest comfort and health outcomes			Oral exam, report
13	2	Explain the principles of human biometeorology, including how weather and climate factors impact human health and behavior	Human biometeorological advice	Lectures classes	Quiz, assignment, Oral exam, report
14	2	Demonstrate the ability to manage, international projects, including planning, executing and monitoring project activities across different countries	International projects	Lectures classes	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation
The total grading is 100%, divided as follows: Monthly Exam 20 marks Quizzes and activities 10 marks Final Exam 70 marks

12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Burton, I., Ebi, K. L., & McGregor, G. (2009). Biometeorology for adaptation to climate variability and change. In *Biometeorology for adaptation to climate variability and change* (pp. 1-5). Dordrecht: Springer Netherlands
Main References (sources)	1-'Human Biometeorology ' by William K.Lauenroth , Lngrid C .Burke 2- 'Principles of Human Biology' by Peter D. Stiling
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

1. Course Name	
Special Functions	
2. Course No.	
508632112	
3. Semester & Year	
Second Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 / 2 (Theory (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Ali Abdul Rasool E-Mail: aaabdulhussein@uomustansiriyah.edu.iq	
8. Course Objectives:	
Course Objective	The main goal of this course is to familiarize students with a new type of functions that are so called "Special Functions" due to their special definitions and behaviors: Gamma function, Beta function, and the relation between their definitions. Students will deal also with a completely new and special way that a certain function can be expanded in a specified interval, this is to say" Fourier Series Expansion" in some interval I. It is necessary for students to going further in their academic study to deal with completely new kind of transformation which can be employed with the aid of initial conditions imposed to solve initial value problems of second order. At the end of this course, students will become familiar with special functions and their applications. Students should be able to deal with Gamma and Beta functions respectively, and convert between the two prominent functions. Students will utilize what they have been taught so far in this course to expand certain type of functions as Fourier Series in a specified interval depending whether the given function is even or odd. Finally, The Laplace transformation will be utilized to solve certain type of initial value problems of second order.
9. Teaching and Learning Strategies	
strategy	Lectures Oral discussion Contests Reports

10. Course structure					
week	**Hours**	**Required Learning Outcomes**	**Unit or Subject Name**	**Learning method**	**Evaluation method**
1	2	Introduction, the factorial function.	Gamma, Beta, and Error Functions I	Lectures & Classrooms	Test, task, oral exam.
2	2	Definition of the gamma function, recursion relation, some important formulas involving gamma functions.	Gamma, Beta, and Error Functions II	Lectures & Classrooms	Test, task, oral exam.
3	2	Beta functions, beta functions in terms of gamma functions, the simple pendulum, The error function.	Gamma, Beta, and Error Functions III	Lectures & Classrooms	Test, task, oral exam.
4	2	Introduction, applications of Fourier series, average value of a function.	Fourier Series and Transforms I	Lectures & Classrooms	Test, task, oral exam.
5	2	Fourier coefficients, Dirichlet conditions, complex form of Fourier series.	Fourier Series and Transforms II	Lectures & Classrooms	Test, task, oral exam.
6	2	Other intervals, even and odd functions, an application to sound.	Fourier Series and Transforms III	Lectures & Classrooms	Test, task, oral exam.
7	2	Exercises	Exercises	Lectures & Classrooms	Test, task, oral exam.
8	2	Exam I	Monthly exam		Exam
9	2	Introduction, the Laplace transform.	Integral Transforms I	Lectures & Classrooms	Test, task, oral exam.
10	2	Solutions of differential equations by Laplace transforms, inverse Laplace transform.	Integral Transforms II	Lectures & Classrooms	Test, task, oral exam.
11	2	Introduction to Integral Transforms III	Integral Transforms III	Lectures & Classrooms	Test, task, oral exam.
12	2	The Dirac delta function, integral transform solution of partial differential equations.	Introduction to Integral Transforms III	Lectures & Classrooms	Test, task, oral exam.
13	2	Exercises	Matrices and vector areas	Lectures & Classrooms	Test, task, oral exam.
14	2	Full review	Full review	Lectures & Classrooms	Test, task, oral exam.
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total score is 100%, divided as follows: Monthly exam 20 marks Tests and Activities 10 Signs Final exam 70 marks	
12.Learning and Teaching Resources	
Textbooks required (curriculum books if applicable)	Churchill, R., & Brown, J. (2014). *E-book: Complex Variables and Applications*. McGraw Hill.
Main references (sources)	K.F. Riley, M.P. Hobson, and S. J. Bench, 2006: Mathematical Methods, for Physics and Engineering,3rd. Edition, by, Cambridge University Press, 1359 p. Marry L. Boas, 2006: Mathematical Methods in Physical Science, 3rd edition. John Wiley & Sons, Inc., 930 p.
Recommended books and references (scientific journals, reports, ...)	Potter, M. C., Goldberg, J. L., & Aboufadel, E. (2005). *Advanced engineering mathematics* (Vol. 3). Oxford: Oxford University Press.
Websites, Websites	https://www.uomustansiriyah.edu.iq/e-learn/profile.php?id=3980

1. Course Name	
English Language	
2. Course No.	
508631081	
3. Semester & Year	
Second Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 / 1 (Theory (2 hr. in week)	
7. Course administrator's name (mention all if more than one name)	
Dr. Ali A. Attiya E-Mail: aliattiya@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objectives	This subject presents the upper-intermediate of English language in general, urging students to learn and master the use of English grammar for the first twelve's units of the curriculum, enabling students to acquire, improve and practice the various skills of English language (listening, speaking, reading and writing).
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Tenses Auxiliary verbs, Short answers, What's in a word?, Social expressions	Unit 1: It's a wonderful world!	Lectures	Quiz, assignment, Oral exam
2	2	Present tenses, Simple or continuous?, Passive, Sport Numbers and dates	Unit 2: Get happy!	Lectures	Quiz, assignment, Oral exam
3	2	Past tenses, Passive, Art and literature, Giving opinions	Unit 3: Telling tales	Lectures	Quiz, assignment, Oral exam
4	2	Modal verbs, obligation and permission, Nationality words, Requests and offers	Unit 4: Doing the right thing	Lectures	Quiz, assignment, Oral exam

5	2	Future forms, the weather, Travelling around	Unit 5: On the move	Lectures	Quiz, assignment, Oral exam
6	2	like Verb patterns, Describing food, towns, and people, Signs and sounds	Unit 6: I just love it!	Lectures	Quiz, assignment, Oral exam
7	2	Exam I	Monthly exam		Exam
8	2	Present Perfect, active and passive, Phrasal verbs, On the phone	Unit 7: The world of work	Lectures	Quiz, assignment, Oral exam
9	2	Conditionals, Time clauses, Base and strong adjectives, Making suggestions	Unit 8: Just imagine!	Lectures	Quiz, assignment, Oral exam
10	2	Modal verbs, probability, Character adjectives, So do l!, Neither do l!	Unit 9: Getting on together	Lectures	Quiz, assignment, Oral exam
11	2	Present Perfect Continuous, Time expressions, Compound nouns, Quantity	Unit 10: Obsessions	Lectures	Quiz, assignment, Oral exam
12	2	Indirect questions, Question tags, The body, Informal English	Unit 11: Tell me about it!	Lectures	Quiz, assignment, Oral exam
13	2	Reported speech, Reporting verbs, Birth, marriage, and death, Saying sorry	Unit 12: Life's great events!	Lectures	Quiz, assignment, Oral exam
14	2	Review	Review	Lectures	
15	2	Exam II	Monthly exam		Exam

11. Course Evaluation

The total grading is 100%, divided as follows:

Monthly Exam 20 marks
Quizzes and activities 10 marks
Final Exam 70 marks

12. Learning and Teaching Resources

Required Textbooks (curricular books, if any)	Liz and John Soars (2009): Intermediate Students Book New Headway Plus, Oxford University Press, UK.
Main References (sources)	
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description of
Fourth Year (First Semester)

1. Course Name	
Cloud Physics	
2. Course No.	
508641022	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Munya Fadhil Jasim E-Mail: *munya.atmsc@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	This course gives an introduction to cloud physics by reviewing the thermodynamic processes in the atmosphere that lead to the formation of clouds, discussing the processes of cloud droplet formation by condensation and diffusion, discussing the growth of cloud droplets in warm and cold clouds, discussing the formation of precipitation.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	liquid water content in terms of drop-size distribution, actual drop size distributions, distance between droplets	Properties of Clouds	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
2	2	The curvature effect and the solute effect	Formation of Cloud Droplets	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report

3	2	Combining the curvature and the solute effects	Formation of Cloud Droplets	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
4	2	Atmospheric aerosols and CCN	Formation of Cloud Droplets	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
5	2	Growth of an individual droplet by condensation	Droplet Growth by Diffusion	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
6	2	Equation of Diffusion Growth	Droplet Growth by Diffusion	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
7	2	Terminal velocity, growth due to collision with smaller droplets of uniform size correction due to collection efficiency	Droplet growth by Collision-Coalescence	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
8	2	Growth rate equation	Droplet growth by Collision-Coalescence	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
9	2	Exam I	Monthly exam		Exam
10	2	Introduction to formation and growth of ice crystals	Growth of ice crystals	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
11	2	Diffusional growth of Ice Crystals	Growth of ice crystals	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
12	2	Collision-coalescence versus Bergeron process	Growth of ice crystals	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
13	2	Ice crystal growth by aggregation & accretion	Growth of ice crystals	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
14	2	Shape of ice crystals	Growth of ice crystals	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Physics and Dynamics of Clouds and Precipitation, by P. K. Wang, Cambridge University Press, 2013.
Main References (sources)	5. Microphysics of Clouds and Precipitation (Atmospheric and Oceanographic Sciences Library) 2nd ed., by H.R. Pruppacher, J.D. Klett, Springer, 1997. 6. Physics and Chemistry of Clouds, by L. Dennis and V. Johannes, Cambridge University Press, 2011.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Cloud Physic Lab
1. Thermodynamics Properties of Air (1).
2. Thermodynamics Properties of Air (2).
3. Properties of Clouds.
4. Formation of Cloud Droplets (Homogeneous and Heterogeneous Nucleation).
5. Exam I
6. Formation of Cloud Droplets (Kohler Theory).
7. Droplet Growth by Diffusion I.
8. Droplet Growth by Diffusion II.
9. Growth by Collision-Coalescence I (Growth Rate in Terms of Radius).
10. Exam II

1. Course Name	
Numerical Weather Prediction I	
2. Course No.	
508641012	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Ahmed S. Hassan E-Mail: ahmed.s.atmsc@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objectives	This course provides an in-depth exploration of the development, principles, and methods used in numerical weather prediction (NWP) over the past fifty years. It covers the historical advancements, theoretical principles, and practical applications of various computational techniques in weather forecasting. The course structured to guide students from the foundational concepts to the latest innovations in the field, emphasizing the role of computing advancements and mathematical modeling.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	Half a Century of Numerical Weather Prediction	Properties weather Prediction	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
2	2	Weather Prediction Equations	Equation of weather prediction	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

3	2	Governing equation	Equation of weather prediction	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
4	2	Finite Differences	Methods of weather prediction	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
5	2	The grids used and their properties	Grid finite equation	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Spectral methods	Method of weather prediction	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
7	2	Using series expansions in terms of functions	Used series function	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
8	2	Spectral method on a doubly periodic domain	Methods for weather prediction	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
9	2	Exam I	Monthly exam		Exam
10	2	The effects of discretization	Distinguish between two methods	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
11	2	Barotropic models using the vorticity equation	Define model	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	The shallow water barotro model	Equation of SW model	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
13	2	Spectral processing of the shall water model	Spectral for SW	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Practical use of the shallow wa model	Prediction use SW	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	1. Jean Coiffier, 2011: Fundamentals of Numerical Weather Prediction. Cambridge University Press, P. 363.
Main References (sources)	1. Atmospheric Modeling, Data Assimilation and Predictability, by Eugenia Kalnay, Cambridge University Press, 2003, P.341
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Numerical Weather Prediction I Lab
1. Importing and Exporting Data
2. Example 2: Import data of the outdoor temperature, Sunlight radiation, pressure and the relative humidity from nivada.xlsx. Do four plots of outdoor temperature, sunlight radiation, pressure, and relative humidity versus time (hours) for Nivada dataset 2007 for four months (Jan. to Apr.)
3. Exercises 1: Write a MATLAB program to read the numerical and analytical solutions in table (1) from excel sheet file to calculate the mean of the numerical values, “Qurter, Hourly, Simidiurnal, Diurnal” Note: use an Excel spreadsheet to reading and writing values. Then draw each of numerical values versus the time steps.
4. FUNCTION M-FILES Example 1: Simple function with ONE INPUTS and TWO OUTPUT
5. Solving a numerical weather problem with MATLAB script.
6. Exam I
7. European Centre for Medium-Range Weather Forecasts (ECMWF) What is NetCDF?
8. Downloading data from specialized weather and climate websites.
9. - The ncdisp command: Open NetCDF File - The ncinfo command: Get Information About NetCDF File - The ncread command: Read Data from NetCDF File
10. What are A NetCDF dataset contains?
11. Example (1):- Retrieve data from nc-file (PRESSURE_9.nc) to read again in excel sheet for Iraq region.
12. Example (2):- Retrieve data from nc-file (PRESSURE_9.nc) to read again in excel sheet for Baghdad region only.
13. Exam II
14. Review
15. Exam III

1. Course Name	
Air Pollution I	
2. Course No.	
508641032	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Husam Tareq Majeed E-Mail: *hussam76@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	This subject presents the history of air pollution, covering its definitions, sources, measurement, and the dynamics of how pollutants interact with the atmosphere. It gives students a comprehensive understanding of how the meteorological factors influence its behavior and impact.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	Air pollution definition, Natural air compositions, Pollutants measure units: Volumetric and Gravimetric, should we worry about air pollution? history of air pollution, air quality standards achievement, accidents and episodes, eras of air pollution, air pollutants, how to define an air pollutant? The chemical composition of dry air, measures units	Introduction	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

2	2	Air pollution sources, Natural sources, Anthropogenic sources. Lifetime of pollutants.	Air Pollution Sources Part I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
3	2	Nature of air pollutants, Primary Air Pollutants, Other pollutants, primary vs. secondary pollutants, major sources of primary pollutants, natural sources, anthropogenic sources of air pollution, criteria air pollutants, sulfur dioxide (SO2), nitrogen dioxide (NO2), mobile source emissions: nitrogen oxides (NO), carbon monoxide (CO), lead (Pb), suspended particulate matter (PM10), mobile source emissions: fine particulate matter (PM2.5), VOCS (volatile organic compounds), and ozone (O3).	Air Pollution Sources Part II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
4	2	Exercises I			
5	2	Secondary pollution. Indoor Air Pollution, Sources of indoor air pollution, mold, monoxide, asbestos, Lead, VOC's, units for measurement of air pollution	Air Pollution Sources Part III	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Exam I	Monthly exam		Exam
7	2	Mobil monitoring networks -Air quality assurance 1. Human health; exposure, how is it introduced to body? how does air pollution affect people? sick building syndrome. 2. Plant health: directly toxic, disruption of plant hormones. Acid deposition: measuring acid rain, increased acidity, compounds, effects of acid rain, buffering capacity.	Measurement Systems and Air Quality Monitoring Part I	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
8	2	Air pollution monitoring systems: Monitoring instrumentation, emission inventory, emission rate, steps to develop emission inventory,	Measurement Systems and Air Quality Monitoring Part II	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

		planning, data collection, information collected during data collection, data analysis, reporting data, uses of an emission Inventory, air pollution in Asia, the importance of climate protection. Monitoring benefits, Air Quality Index (AQI), Air Quality Standards			
9	2	Exercises II			
10	2	Stationary monitoring networks, Mobil monitoring networks, Ozone NAAQS Revisions, SO_2 NAAQS Revisions, Remedies and Solutions, Monitoring Stations, Monitoring Networks,	Measurement Systems and Air Quality Monitoring Part III		Exam
11	2	– Dynamic forces influencing air pollution. – Local wind systems, wind rose, wind speed profile. – Atmospheric turbulence Dry adiabatic lapse rate, atmospheric stability, and temperature profile	Air Pollution Meteorology**1**	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	Exam II	Monthly exam		Exam
13	2	Thermal Inversion, Potential temperature, Mixing height	Air Pollution Meteorology**2**	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Exercises III			
15	2	General Review for Final Exam			

11.Course Evaluation

The total grading is 100%, divided as follows:

Monthly Exam	20 marks
Practical	12 marks
Quizzes and activities	8 marks
Final Exam	60 marks

12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Seinfeld, J. H., & Pandis, S. N. (2016). *Atmospheric chemistry and physics: from air pollution to climate change*. John Wiley & Sons.
Main References (sources)	Vallero, D. A. (2014). *Fundamentals of air pollution*. Academic press. Fifth Edition.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Air pollution I Lab
1. Conversions of units of measurement for gaseous pollutants and particulates
2. Calculation the severity degree of some gaseous pollutants and particles
3. Installation of a pollutant rose.
4. Calculate the level of noise pollution in the laboratory.
5. Exam I
6. Guess the horizontal wind speed at the nozzles flue.
7. Determining the stability of the atmosphere and its impact on pollution
8. Estimate the mixing height of pollutants day and night
9. Exam II

1. Course Name	
Meteorological statistics	
2. Course No.	
508641042	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Yaseen Kadhim Abbas Al-Timimi E-Mail: *yaseen.altimimi@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	This course provides an in-depth introduction to statistical methods with a focus on their application in meteorology. It covers both descriptive and inferential statistics, emphasizing the importance of understanding and interpreting meteorological data.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	What is Statistics? What is meteorological Statistics? Descriptive and Inferential Statistics. Uncertainty about the meteorological statistics.	Introduction and Framework	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
2	2	Population and sample, continuous and discrete variable, Raw data, frequency distribution, frequency histogram, relative-frequency distribution, cumulative frequency	Frequency Measures	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

3	2	arithmetic means of ungrouped data, Arithmetic mean of grouped data. properties of arithmetic mean.	Measures of Central Tendency	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
4	2	weighted arithmetic mean, The geometric mean, The harmonic mean, The relation between the arithmetic, geometric and harmonic mean.	Measures of Central Tendency	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
5	2	Quartiles, deciles and percentiles.	Measures of Central Tendency	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Solved Problems	Measures of Central Tendency	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
7	2	Exam I	Monthly exam		Exam
8	2	Median of ungrouped data, median of grouped data.	Measures of Central Tendency	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
9	2	Mode of ungrouped data, mode of grouped data. The relation between the mean, median and mode, Solved Problems.	Measures of Central Tendency	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
10	2	The range, The mean deviation, standard deviation, properties of standard deviation	Measures of Dispersion	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
11	2	The variance, short methods for computed standard deviation.	Measures of Dispersion	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	quartile deviation, The percentile range, The relation between the measures of dispersion.	Measures of Dispersion	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
13	2	absolute dispersion, coefficient of variation, standard scores. Solved Problems	Measures of Dispersion	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Solved Problems.	Measures of Dispersion	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11. Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12. Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Statistical Methods in the Atmospheric Sciences, Second Edition, D.S. Wilks, Elsevier Inc., 2006.
Main References (sources)	**[**1]: Introductory statistics, ninth Edition, Neil A. Weiss, 2012. [2]: Elementary Statistics: A Step-by-Step Approach, seventh Edition, Allan G. Bluman,2007 [3]: Introductory statistics, seventh Edition, PREM S. MANN, John Wiley & Sons, 2010.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Meteorological statistics Lab
1. Basics of Statistics, Tabular display, Frequency distribution or frequency table, Construction of a frequency table.
2. Measures of Central Tendency The arithmetic means for (unclassified data and classified data).
3. Mean and Median for (unclassified data and classified data).
4. The harmonic mean, The geometric mean, The weighted mean for (unclassified data and classified data).
5. Exam I
6. Measures of Dispersion and Variability
7. The standard deviation.
8. Mean Center.
9. Metrics of skewness and kurtosis.
10. Exam II

1. Course Name	
Renewable energy	
2. Course No.	
508621081	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30/2 (Theory (2 hr. in week)	
7. Course administrator's name (mention all if more than one name)	
Prof. Dr. Alaa M. AL-Lami *al.shayia.atmsc@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	The course provides an introduction to Renewable energy and its applications, the principles, and technologies related to renewable sources such as solar, wind, hydro, biomass, and geothermal. The course includes educational videos to supplement learning, combines theoretical lessons with practical exercises, ensuring a good understanding of this field.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Total energy usage, forms of alternative energy		lectures	Quiz, assignment, Oral exam, report
2	2	Energy resources are generally distinguished		lectures	Quiz, assignment, Oral exam, report
3	2	Applications of renewable energies		lectures	Quiz, assignment,

					Oral exam, report
4	2	Calculation of Wind Energy and Power		lectures	Quiz, assignment, Oral exam, report
5	2	Describing Wind Variations: Weibull Distribution, Exercises.		lectures	Quiz, assignment, Oral exam, report
6	2	Solar Power, Solar radiation, Atmospheric Influence on Solar Radiation		lectures	Quiz, assignment, Oral exam, report
7	2	Efficiency of solar cell, Exercises.			Quiz, assignment, Oral exam, report
8	2	First Exam	Monthly exam	lectures	Quiz, assignment, Oral exam, report
9	2	Geothermal power		lectures	Exam
10	2	Dry steam, flash steam and binary cycle systems		lectures	Quiz, assignment, Oral exam, report
11	2	Hydro Power		lectures	Quiz, assignment, Oral exam, report
12	2	Tidal Power		lectures	Quiz, assignment, Oral exam, report
13	2	Biomass Burning		lectures	Quiz, assignment, Oral exam, report
14	2	Discussion with educational vid		lectures	Quiz, assignment, Oral exam, report
15	2	Second Exam	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 24 marks Quizzes and activities 6 marks Final Exam 70 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Jäger, K. D., Isabella, O., Smets, A. H., van Swaaij, R. A., & Zeman, M. (2016). Solar energy: fundamentals, technology and systems. UIT Cambridge.
Main References (sources)	**[1]:** Chen, C. J. (2011). *Physics of solar energy*. John Wiley & Sons. **[2]:** Petersen, E. L., Mortensen, N. G., Landberg, L., Højstrup, J., & Frank, H. P. (1997). Wind power meteorology.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

1. Course Name	
English Language	
2. Course No.	
508621071	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 / 1 (Theory (2 hr. in week),	
7. Course administrator's name (mention all if more than one name)	
Dr. Ali A. Attiya E-Mail: aliattiya@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objectives	This subject presents the upper-intermediate of English language in general, urging students to learn and master the use of English grammar for the first twelve's units of the curriculum, enabling students to acquire, improve and practice the various skills of English language (listening, speaking, reading and writing).
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	The tense system, Informal language, Compound words, social expressions	Unit 1: No place like home:	Lectures, class	Quiz, assignment, Oral exam
2	2	Present Perfect, Simple and continuous, Hot verbs- make and do Exclamations	Unit 2: Been there, done that!	Lectures, class	Quiz, assignment, Oral exam
3	2	Narrative tenses, giving news and responding, Books and films, Showing interest	Unit 3: What a story!	Lectures, class	Quiz, assignment, Oral exam
4	2	Questions and negatives, Prefixes and antonyms, Being polite	Unit 4: Nothing but the truth:	Lectures, class	Quiz, assignment, Oral exam

5	2	Future forms, Hot verbs - take, put, Telephoning	Unit 5: An eye to the future:	Lectures, class	Quiz, assignment, Oral exam
6	2	Expressions of quantity, export, Business expressions and numbers	Unit 6: Making it big:	Lectures, class	Quiz, assignment, Oral exam
7	2	Exam I	Monthly exam		Exam
8	2	Modals and related verbs 1, Hot verb get, Exaggeration and understatement	Unit 7: Getting on together:	Lectures, class	Quiz, assignment, Oral exam
9	2	Relative clauses, Participles, Adverb collocations, The world around	Unit 8: Going to extremes:	Lectures, class	Quiz, assignment, Oral exam
10	2	Expressing habit, used to do/doing, Homonyms/Homophones, Making your point	Unit 9: Things ain't what:	Lectures, class	Quiz, assignment, Oral exam
11	2	Modal auxiliary verbs 2, Synonyms, Metaphors and idioms - the body	Unit 10: Risking life and limb:	Lectures, class	Quiz, assignment, Oral exam
12	2	Hypothesizing, Expressions with if, Word pairs, Moan and groans	Unit 11: In your dreams:	Lectures, class	Quiz, assignment, Oral exam
13	2	Articles, Determiners, Hot words - life, time Linking and commenting	Unit 12: It's never too late:	Lectures, class	Quiz, assignment, Oral exam
14	2	Review	Review	Lectures, class	
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation

The total grading is 100%, divided as follows:

Monthly Exam 20 marks
Quizzes and activities 10 marks
Final Exam 70 marks

12.Learning and Teaching Resources

Required Textbooks (curricular books, if any)	Soars, J., & Soars, L. (2009). New Headway Plus: Upper-intermediate. Student's Workbook CD. Oxford University Press.
Main References (sources)	
Recommended books and references	

(scientific journals, reports, …)	
Electronic references, Websites	

1. Course Name	
Research Project I	
2. Course No.	
508621062	
3. Semester & Year	
First Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 / 2 (Theoretical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Sama K. Mohammed E-Mail: sama.atmsc@uomustansiriyah.edu.iq	
8. Course Objectives	
Course Objectives	This course presents the required knowledge in conducting research of all meteorological majors including the application of scientific methodology to meteorological or climatological data and problem solving. The objective is to develop the skills necessary to conduct a graduation research project and assist the students in the determination of the appropriate research topics, procedures, and methodologies.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes and assignments Reports A visit to the libraries in the Campus

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	• having an overview of the academic research and scientific method steps.	Introduction to the course	Theoretical lecture with examples	Oral exam
2	2	• finding an idea for science project • knowledge of the properties of a scientific question.	The research question	Theoretical lecture with examples	assignment

3	2	• giving the roadmap of research plan • finding information sources • evaluating resources • write a bibliography, research paper	Background research	Theoretical lecture with examples using some websites	assignment, Oral exam
4	2	• learn how to narrow the research topic • learn about the types of scientific sources (quantitative or qualitative, fact or opinion, primary, secondary & tertiary sources, popular, professional, & scholarly, publication formats and the information lifecycle, scholarly articles as sources)	Narrow the topic of the research, types of Scientific sources	Theoretical lecture with examples using some websites	assignment, Oral exam
5	2	• evaluating data • data visualization • citing data	Data as Sources	Theoretical lecture with examples using some websites	assignment, Oral exam,
6	2	• step-by-step instructions for reading a primary research article	Reading a Primary Research Article	Theoretical lecture with examples using a research paper	assignment, Oral exam,
7	2	have the knowledge about the sources for the following needs: • background needs • answer the research question • convince the audience • to describe the situation • report what others have said	Sources and Information Needs	Theoretical lecture with examples	Quiz, assignment, Oral exam
8	2	• introducing the student to the central library system and its facilities • the available scientific resources and how to obtain them.	Central Library System	Visiting the Central Library	assignment

				in the campus	
9	2	Exam I	Monthly exam		Exam
10	2	• why precision searching and the main concepts. • related and alternative terms. • search statements and strategy. • search tools • some tips for common search tools	Precision Searching	Theoretical lecture with examples using some websites	assignment, Oral exam
11	2	• learn the ethical use and citi sources. • why cite sources? challenges in citing sources	Ethical Use of Sources	Theoretical lecture with examples	assignment, Oral exam
12	2	• citation styles • steps for citing • citation software • when to cite when to quote, paraphrase, or summarize	References and Citation	Theoretical lecture with examples using Microsoft word	assignment, Oral exam
13	2	giving the structure of scientific research (title, abstract, introduction, literature review, material and method, results, discussion, conclusions and acknowledgment).	Basic principles in scientific writing	Theoretical lecture with examples	report
14	2	how to manage different references: • referring within the text or list of cited references. • journal papers • book, book edition, chapter in a book • monographs • edited volume papers • conference proceedings papers • unpublished reports, theses etc. • computer programs • CD or DVD ROM • webpages	Basic principles in scientific writing (continues)	Theoretical lecture with examples	report

		• appendix • tables • figures, graphs and flowcharts photographs and maps			
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation
The total grading is 100%, divided as follows: Monthly Exam1 14 mark Monthly Exam2 14 mark Quizzes and activities 2 mark Final Exam 70 marks

12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Turabian, K. L., Booth, W. C., Colomb, G. G., Williams, J. M., & University of Chicago Press Staff, W. C. (2013). A Manual for Writers of Research Papers, Theses, and Dissertations, Seventh Edition. In *A Manual for Writers of Research Papers, Theses, and Dissertations, Seventh Edition*. https://doi.org/10.7208/chicago/9780226823386.001.0001
Main References (sources)	
Recommended books and references (scientific journals, reports, …)	Lowry, C. (2018). Choosing and Using Sources: A Guide to Academic Research. In *The Ohio State University* (Issue July).
Electronic references, Websites	https://violentmetaphors.com/wp-content/uploads/2018/01/how-to-read-and-understand-a-scientific-article.pdf http://datavizproject.com/ https://datavizcatalogue.com/ https://guides.osu.edu/ld.php?content_id=41522868 https://www.thesaurus.com/ https://libraryapp.uomustansiriyah.edu.iq/eba3raa.php?a=reset https://afiqa.net/ https://iqdr.iq/index?lang=ar https://owl.purdue.edu/ https://www.tau.ac.il/~harnik/lab/report-guidlines/author_reference_guide.pdf https://libraryguides.vu.edu.au/harvard/home

Course Description of
Fourth Year (Second Semester)

1. Course Name	
Precipitation Physics	
2. Course No.	
508642092	
3. Semester & Year	
Second Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Munya Fadhil Jasim E-Mail: *munya.atmsc@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	The objectives of this course are understating the microphysics processes leading to the formation of rain and snow, study and understand the weather radar and its applications, and discussing the atmospheric electricity and the formation and development of thunderstorms.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Drop-size distribution, drop breakup	Rain and Snow	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
2	2	Distribution of snowflakes with size, aggregation and breakup of snowflakes, precipitation rates	Rain and Snow	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report

3	2	Basic principles of weather radar	Weather radar	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
4	2	Weather radar equation	Weather radar	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
5	2	Doppler weather radar, polarization weather radar	Weather radar	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
6	2	Applications of weather radar	Weather radar	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
7	2	Introduction of weather Modification, simulation of rain and snow	Weather modification	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
8	2	Cloud dissipation, hail suppression	Weather modification	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
9	2	Exam I	Monthly exam		Exam
10	2	The governing equations, one-dimensional models, model evaluation	Numerical Cloud Models	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
11	2	Two-dimensional models, three-dimensional models	Numerical Cloud Models	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
12	2	Electrical properties of the fair-weather atmosphere	Atmospheric electricity	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
13	2	Some possible thunderstorm charging mechanisms, Benjamin Franklin's famous kite experiment cloud-to-ground (CG) lightning	Atmospheric electricity	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
14	2	Intra-cloud (IC) lightning, other forms of lightning, thunder, lightning rods	Atmospheric electricity	Lectures, Laboratory classes	Quiz, assessment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11. Course Evaluation
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks

12. Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Physics and Dynamics of Clouds and Precipitation, by P. K. Wang, Cambridge University Press, 2013.
Main References (sources)	- Microphysics of Clouds and Precipitation (Atmospheric and Oceanographic Sciences Library) 2nd ed., by H.R. Pruppacher, J.D. Klett, Springer, 1997. - Physics and Chemistry of Clouds, by L. Dennis and V. Johannes, Cambridge University Press, 2011.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Precipitation Physic Lab
1- Growth by Collision-Coalescence II (Droplet Altitudes and Trajectories).
2- Growth of Ice Crystals I (Diffusional Growth of Ice Crystals).
3- Growth of Ice Crystals II (Growth by Aggregation).
4- Growth of Ice Crystals III (Growth by Accretion).
5- Exam I
6- Rain Size Distribution
7- Snow-flake size distribution
8- Weather Radar
9- Z-R Relationships
10- Exam II

1. Course Name	
Numerical Weather Prediction II	
2. Course No.	
508642082	
3. Semester & Year	
Sconed Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Ahmed S. Hassan E-Mail: *ahmed.s.atmsc@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	This course provides the mathematical and computational frameworks of atmospheric models, focusing on barotropic and baroclinic models, which are essential for understanding and predicting weather patterns. Through theoretical instruction and practical application, students will explore the development, implementation, and operational use of these models in meteorology.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	Ordinary and partial differential equation	Equation for NWP	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
2	2	Operator splitting	Solve NWP equation	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
3	2	Advection Diffusion equations	Solve NWP equation	Lectures, Laboratory classes	Quiz, assignment,

					Oral exam, report
4	2	Finite –difference or series expansion methods	Method for NWP	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
5	2	Consistency, Convergence, and Stability	Filtering problem	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Arbitrary- Order Approximations of Derivatives	Filtering problem	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
7	2	Operational forecasting	NWP Methods	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
8	2	Objective analysis and data assimilation	Analysis of NWP	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
9	2	Exam I	Monthly exam		Exam
10	2	Initialization of data on starting the model.	Initial conditions	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
11	2	Coupled models	Coupled Model	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	The forecasting process	Coupled Model	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
13	2	Forecast verification	NWP methods	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Ensemble forecasting	NWP methods	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	1. Jean Coiffier, 2011: Fundamentals of Numerical Weather Prediction. Cambridge University Press, P. 363.
Main References (sources)	1. George J. Haltiner, 1971: Numerical Weather Prediction. John Wily and Son, Inc, P. 326. 2. Eugenia Kalnay, 2003: Atmospheric Modeling, Data Assimilation and Predictability. Cambridge University Press, P. 341. 3. Mark Z. Jacobson, 2005: Fundamentals of Atmospheric Modeling, 2nd edition. Cambridge University Press, P. 828.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Numerical Weather Prediction II Lab
1. Open Source: Linux Operating System
2. Introduction to Linux System: What is shell? What is terminal? The Linux Command Line.
3. Grid Analysis and Display System (GrADS) What is GrADS? How to use GrADS Sample model Session
4. Operations On The Data
5. Controlling Graphics Output We can overlay different graphics types
6. Exam I
7. Working with NetCDF files netcdf (GrADS version 1.9) Data file is NetCDF. Although NetCDF files are self-describing and may be read automatically using the sdfopen/xdfopen commands
8. Forecast Surface Low Pressure
9. Forecast the surface low pressure center value and position from the polar jet core speed value and position.
10. Polar Jet Core Simple program
11. MATLAB GUI Programming
12. What Is GUIDE?
13. Starting GUIDE
14. Exam II
15. Review

1. Course Name	
Air Pollution II	
2. Course No.	
508642102	
3. Semester & Year	
Second Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Husam Tareq Majeed E-Mail: *hussam76@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	This subject presents the comprehensive understanding of the behavior, dispersion, and control of air pollutants in the atmosphere. Students will explore the principles governing the movement of pollutants, the impact of these pollutants on various aspects of the environment and human health, and the methods used to control and mitigate their effects. The course includes theoretical foundations, practical applications.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	- Buoyant acceleration of parcel. - Ideal dispersion of air pollutants - Plume behavior as a function of initial source parameter. - Stack effluent exit velocity, Stack effluent temperature	Air pollutants dispersion	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

2	2	Plume rise (part I)	Box model (Part I)	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
3	2	- General equation of Gaussian plume. - Indoor air pollution	Box model (Part II)	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
4	2	Exercises I			
5	2	Dry deposition	Air Pollutants deposition (Part I)	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Exam I	Monthly exam		Exam
7	2	Wet deposition	Air Pollutants deposition (Part II)	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
8	2	Human health, Plants, Material and structures, Visibility,	Air Pollution effects (Part I)	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
9	2	Exercises II			
10	2	- Visibility, Climate - Clouds and precipitation - Upper atmosphere - Climate change	Air Pollution effects (Part II)		Exam
11	2	- Control methods on the pollution. - Treatment of air pollution	Air pollution control	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	Exam II	Monthly exam		Exam
13	2	Risk analysis and assessment		Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Exercises III			
15	2	General Review for Final Exam		Lectures, Laboratory classes	

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Seinfeld, J. H., & Pandis, S. N. (2016). *Atmospheric chemistry and physics: from air pollution to climate change*. John Wiley & Sons.
Main References (sources)	Vallero, D. A. (2014). *Fundamentals of air pollution*. Academic press. Fifth Edition.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Air pollution II Lab
1. Measure the amount of particles accumulated and deposited on the horizontal surfaces.
2. Choose the behavior of the spread of pollutants according to the instantaneous stability of air
3. Estimating the rise of polluted Blinders
4. Calculating the emission rate of pollutants from a single chimney
5. Exam I
6. Estimating SO_2 concentrations using the Gauss model
7. Calculating the transparency of dust particles to incident light (visibility range)
8. Explain the phenomenon of global warming
9. Exam II

1. Course Name	
Meteorological Data Analysis	
2. Course No.	
508642112	
3. Semester & Year	
Second Semester, (2024 / 2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
45 / 3 (Theory (2 hr. in week), Practical (2 hr. in week))	
7. Course administrator's name (mention all if more than one name)	
Dr. Yaseen Kadhim Abbas Al-Timimi E-Mail: *yaseen.altimimi@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	In this course, the students are introduced to fundamental concepts of data analysis which include Probability, discrete and continuous probability distribution, the Analysis of Variance Table (ANOVA), and time series. These topics are covered broadly but in depth to introduce students to the methods atmospheric scientists use to describe and the atmospheric phenomena.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Probability Definition of Probability, Simple and compound events, calculating Probability, Solved Problems.	Probability	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
2	2	discrete probability distribution.	Probability	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report

3	2	continuous probability distribution.	Probability	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
4	2	Normal Distribution.	Distribution	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
5	2	Standard normal Distribution.	Probability	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
6	2	Solved Problems	Probability	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
7	2	Exam I	Monthly exam		Exam
8	2	Application of probability distribution	Probability	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
9	2	Hypothesis Testing, The Analysis of Variance (ANOVA), Solved Problems.	Hypothesis Testing	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
10	2	Time Series, Components of time Series.	Time Series	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
11	2	Trends of time Series analysis,	Time Series	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
12	2	Seasonal variation of time Series analysis.	Time Series	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
13	2	Application of time Series.	Time Series	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
14	2	Solved Problems.	Time Series	Lectures, Laboratory classes	Quiz, assignment, Oral exam, report
15	2	Exam II	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 20 marks Practical 12 marks Quizzes and activities 8 marks Final Exam 60 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	[1]: Statistical Methods in the Atmospheric Sciences, 3rd Edition, D.S. Wilks, Elsevier Inc., 2011. [2]: Statistical Analysis in Climate Research by Hans von Storch, Francis W. Zwiers, Cambridge University Press, 2002.
Main References (sources)	[1]: Introductory statistics, ninth Edition, Neil A. Weiss, 2012. [2]: Elementary Statistics: A Step-by-Step Approach, seventh Edition, Allan G. Bluman,2007 [3]: Introductory statistics, seventh Edition, PREM S. MANN, John Wiley & Sons, 2010.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

Course Description Template

Course Name
Meteorological Data analysis Lab
1. Correlation coefficient: linear relation, correlation scale, multiple correlation coefficient
2. Spearman correlation
3. Regression analysis, simple linear regression, multiple linear regression, non-linear regression
4. The Coefficient of Determination (R2).
5. Exam I
6. Standard Error of Estimate.
7. Hypothesis Test: 1- The null hypothesis, 2- Alternative Hypothesis.
8. Z-test, T-test
9. Time Series, Time series components.
10. Models used in time series, Moving Average Model,
11. Permutation and Combination
12. Exam II

1. Course Name	
Environmental Disaster Management	
2. Course No.	
508622142	
3. Semester & Year	
Second Semester, (2024-2025)	
4. Date of Description Preparation	
1/4/2025	
5. Available Attendance Forms	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 / 2 (Theory (2 hr. in week)	
7. Course administrator's name (mention all if more than one name)	
Prof. Dr. Alaa M. AL-Lami *al.shayia.atmsc@uomustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	The course is intended to provide a general concept in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Definition, Types of disasters and their consequences, Sudden disasters, Creeping disasters.		lectures	Quiz, assignment, Oral exam, report
2	2	Main components of disaster management, Hazard, Vulnerability, Physical Vulnerability, Socio-economic Vulnerability.		lectures	Quiz, assignment, Oral exam, report
3	2	Capacity, Physical Capacity, Socio-economic Capacity, Risk, level of risk.		lectures	Quiz, assignment, Oral exam, report

4	2	Disaster management cycle, Disaster management aims, Sustainable Development.		lectures	Quiz, assignment, Oral exam, report
5	2	Mitigation, Structural measures. Non-structural measures, Preparedness, Common preparedness measures.		lectures	Quiz, assignment, Oral exam, report
6	2	Response, Response efforts, Recovery, Recovery efforts.		lectures	Quiz, assignment, Oral exam, report
7	2	Exam	Monthly exam		Exam
8	2	The International Strategy for Disaster, Government disaster management efforts, Efforts of humanitarian organizations, Population efforts.		lectures	Quiz, assignment, Oral exam, report
9	2	Manage flood disaster, Causes of Floods, Effects of Floods, Methods of Control.		lectures	Exam
10	2	Manage drought disaster, Drought as a Natural Hazard, Causes of Drought, Human Causes.		lectures	Quiz, assignment, Oral exam, report
11	2	Drying out of Surface Water Flow, Global Warming, Types of Drought, Meteorological drought, Hydrological Drought, Agriculture Drought.		lectures	Quiz, assignment, Oral exam, report
12	2	The Impacts of Drought, Economic Losses, Environmental Impacts, Impacts on Society, Methods of Control.		lectures	Quiz, assignment, Oral exam, report
13	2	Preparedness: Long-Term Measures, Improving demand management, Types of environmental pollution disasters and their management.		lectures	Quiz, assignment, Oral exam, report
14	2	Manage Earthquake disaster, Causes and Effects of Earthquake, Methods of Control.		lectures	Quiz, assignment, Oral exam, report
15	2	Exam	Monthly exam		Exam

11.Course Evaluation	
The total grading is 100%, divided as follows: Monthly Exam 24 marks Quizzes and activities 6 marks Final Exam 70 marks	
12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Navale Pandharinath. Earth and Atmospheric Disasters Management Natural and Man-made. BSP BS Publications, 2009.
Main References (sources)	1. Modh, Satish. Introduction to disaster management. Macmillan, 2009. 2. Phillips, Brenda, David M. Neal, and Gary Webb. Introduction to emergency management. CRC Press, 2016.
Recommended books and references (scientific journals, reports, …)	
Electronic references, Websites	

1. Course Name:	
Physics of Ionosphere	
2. Course No.:	
508642122	
3. Semester & Year:	
Second Semester, (2024 / 2025)	
4. Date of Description Preparation:	
1/4/2025	
5. Available Attendance Forms:	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 / 2 Theory (2 hr. in week)	
7. Course administrator's name (mention all if more than one name)	
Dr. Baidaa Jaafar Hassan E-Mail: *baidaa71.atmsc@unmustansiriyah.edu.iq*	
8. Course Objectives	
Course Objectives	This course describes the plasma environments in the solar system in terms of geographical extension as well as physical properties and processes, including typical plasma regions in and around magnetospheres.
9. Teaching and Learning Strategies	
Strategy	Lectures Oral discussion Quizzes Reports

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Existence of plasma in space, magnetic fields in space.	plasma in space	Lectures, Video lectures	Quiz, assignment, Oral exam, report.
2	2	Solar radiation, Solar atmosphere.	Solar radiation, and Atmosphere.	Lectures, Video lectures,	Quiz, assignment, Oral exam, report
3	2	Solar activity, solar wind, heliosphere, solar sails.	Solar activity, solar wind.	Lectures, Video lectures	Quiz, assignment, Oral exam, report
4	2	The magnetospheres, radiation belts, and Motion of charged particles in magnetic fields.	The magnetospheres	Lectures, Video lectures	Quiz, assignment,

					Oral exam, report
5	2	Ionospheres and plasma-spheres of the Earth and other celestial bodies.	Ionospheres and plasma-spheres	Lectures, Video lectures	Quiz, assignment, Oral exam, report
6	2	Shock waves and boundary layers, the cellular structure of space.	Shock waves and boundary layers	Lectures, Video lectures	Quiz, assignment, Oral exam, report
7	2	Waves in an unmagnified plasma, radio wave propagation, electrostatic waves.	Waves in an unmagnified plasma	Lectures, Video lectures	Quiz, assignment, Oral exam, report
8	2	First Exam	Monthly exam		Exam
9	2	Magneto hydrodynamic waves, energy transport.	Energy transport.	Lectures, Video lectures	
10	2	Instabilities and damping, particle acceleration.	Instabilities and damping, particle acceleration.	Lectures, Video lectures	Quiz, assignment, Oral exam, report
11	2	Dynamics of the magnetosphere, sub storms and space weather		Lectures, Video lectures	Quiz, assignment, Oral exam, report
12	2	Currents in magnetosphere-ionosphere systems, aurora, magnetic storms.	Currents in magnetosphere and aurora,	Lectures, Video lectures	Quiz, assignment, Oral exam, report
13	2	Rocket principle, motion in a central force field.	Rocket principle	Lectures, Video lectures	Quiz, assignment, Oral exam, report
14	2	Electrical and thermal interaction of spacecraft with the local environment. Ion engines.	Electrical and thermal interaction	Lectures, Video lecturers	Quiz, assignment, Oral exam, report
15	2	Second Exam.	Monthly exam		Exam

11. Course Evaluation

The total grading is 100%, divided as follows:

Monthly Exams	22 marks
Quizzes and activities	8 marks
Final Exam	70 marks

12.Learning and Teaching Resources	
Required Textbooks (curricular books, if any)	Robert Schunk, Andrew Nagy, 2010 "Ionospheres", Cambridge University Press
Main References (sources)	Vladimir Bychkov, Gennady Golubkov, Anatoly Nikitin,"The Atmosphere And Ionosphere".Springer , 2nd edition. UK.
Recommended books and references (scientific journals, reports, …)	https://search.app/55AgNPK1VZgL2QZ96 https://search.app/RWw9Ho1VHUdrxEMU9
Electronic references, Websites	https://search.app/87A8yAHUiyEqQCru9