|  |  |
| --- | --- |
| **Department of Land, Water & Environment** | **Agrometeorology (634230)** |
| **Faculty of Agriculture** | **Instructor: Dr. Fayha Al-Shibli** |
| **University of Jordan**  **Office # 131** | **email:** [**f.shibli@ju.edu.jo**](mailto:f.shibli@ju.edu.jo)  **Office hours: 8:30-10:00 Mondays and Wednesdays** |

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Course Description and Expectations (1 hour)**

**Chapter One – Introduction and General Overview: (2 hours)**

* Agricultural meteorology definition
* importance and scope;
* General importance.
* Applications.
* Conditions and requirements
* tools and mechanisms in Agricultural meteorology
* Diagnostic and conceptual framework
* Agrometeorological research
* Primary research tools (data, quantification, statistics, indices and modelling)
* Agrometeorological monitoring and early warning (tools for warning)
* Forecasting and prediction in agrometeorology (tools to guide preparedness)
* Agrometeorological aspects of crop, forest and livestock protection
* Policy matters relating to agrometeorology (initial and boundary conditions set)
* Climate resources assessment for agrometeorology.
* Water resources assessment for agrometeorology.
* Soil resources assessment for agrometeorology.
* Biomass resources assess
* Agrometeorological services.
* Training, Education and Extension in Agricultural Meteorology
* Challenges Met and Remaining in Agricultural Meteorology

**Chapter Two: Agrometeorological variables and their measurements (3 hours)**

* Basic Aspects of Agricultural Meteorological Observations and Data
* Data as a support system for agrometeorological services
* Physical climatic variables
* Biological variables
* Scale of observations
* Extent of observations
* Data without metadata are unreliable
* Agricultural Meteorological Stations
* Classification
* Selection and layout of a station site
* Primary handling of data
* Networks
* Documentation of agricultural meteorological stations
* Inspection and supervision of stations
* Fixed agrometeorological stations
* Mobile stations
* Agricultural meso-climatological surveys
* Observations to be carried out at agricultural meteorological stations
* Observations of the physical environment and its measurements
* Observations of a biological nature and its measurements

**Chapter Three: Introduction to the physics of the atmosphere (3 hours)**

* laws of radiation, solar and terrestrial radiation,
* surface and atmospheric energy balances,
* precipitation formation,
* atmospheric optical and electrical phenomena

**Chapter Four: Agricultural Meteorological Data, Their Presentation and Statistical Analysis (6 hours)**

* Data for Agricultural Meteorology (Collection, Format, Recording and Catalogue)
* Distribution of Data
* Requirements for research
* Special requirements for agriculturists
* Determining the requirements of users
* Minimum distribution of agroclimatological documents
* Database Management
* CLICOM Database Management System
* Geographical Information System (GIS)
* Weather generators (WGs)
* Agrometeorological Information and forecast
* Statistical Methods of Agrometeorological Data Analysis
* Series checks
* Climatic scales
* Population parameters and sample statistics
* Frequency distributions
* Measuring central tendency
* Fractiles
* Measuring dispersion
* Decision-Making
* Publication of Results
* Basics on Remote-Sensing and GIS Applications in Agrometeorology

**Midterm Assessment 03/11/2019 Sunday**

**Chapter Five: Weather and Climate Forecasts for Agriculture (6 hours)**

* Need and Requirements for Weather Forecasts for Agriculture
* Climate-based strategic agronomic planning
* Weather events
* Usefulness of weather forecasts
* Weather forecasts for agriculture: essential requirements
* Some unique aspects of agricultural weather forecasts
* Characteristics of weather forecasts
* Considerations related to agricultural weather forecasts
* Elements of agricultural weather forecasts
* Format of forecasts
* Forecasts for agricultural purposes
* Special agricultural weather forecasts
* Field preparation
* Sowing/planting
* Application of agricultural chemicals
* Evaporation losses for irrigation
* Weeding
* Crop harvest and post-harvest operations
* Control of plant diseases
* Control of noxious insects
* Transport of agricultural products
* Operation of agricultural aviation
* Prevention of damage due to chilling, frost and freezing
* Forestry operations
* Fishery operations
* Probability Forecasts
* The rationale for probability forecasts
* Formulation
* Probability forecasts at different scales
* Probabilistic forecast formats
* Deriving forecast distributions
* Interpretation and attributes of probability forecasts
* Communicating probabilistic forecasts to farmers
* Nowcasting and Very Short-Range Forecasts, short and medium forecasts, and long-range forecasts

**Chapter Six: Agrometeorological Forecasting (6 hours)**

* Scope of agrometeorological forecasting.
* Forecasting techniques in general.
* Areas of application of agrometeorological forecasts.
* Variables used in agrometeorological forecasting
* Soil water balance: moisture assessment and forecast
* Actual evapotranspiration (ETA)
* Various indices as measures of environmental variability
* Heat supply forecast.
* Potential biomass and reference yield
* Implementation of Yield Forecasts in Practice
* Data requirements
* Calibration and sources of error
* Basic Agrometeorological Forecasting Approaches.
* Empirical Statistical Relations
* Crop simulation models
* Non-parametric forecasts
* Combination of methods
* Extreme factors.
* Special applications
* Pests and diseases
* Fire forecasting.
* Phenology
* Climate change

**Chapter Seven: Climate and Weather Risk Assessment for Agricultural Planning (3 Hours)**

* Understanding the climate mechanisms that contribute to climate- and weather-related risks
* Climatic hazards
* Types
* Categories
* Scale studies for climatic anomalies
* Space
* Time
* Space–time scales
* Agrometeorological applications in the characterization of climatic hazards – modelling and data needs.
* General circulation models
* Regional circulation models
* Historical local climate data
* Agronomic models.
* Vegetation suitability maps
* Remote-sensing
* Methods of risk assessment.
* Extreme cases
* Developing and implementing policy to reduce the risk and impact of extreme events
* On-farm planning to reduce the risk and impact of extreme events

**Chapter Eight: Effects of Climate Change on Agriculture (3 Hours)**

* Summary of evidence for climate change.
* Summary of IPCC protocol for climate change impact assessment.
* Sources of climate change data
* Models for evaluating climate change impacts
* Preparation for climate change impact assessment.
* Assessing the effect of climate change on bioresource industries

**Chapter Nine: Applications of Meteorology to Agriculture (3 Hours)**

* Users of agrometeorological information
* Applications for governments and other large administrative bodies
* Applications for farmers or groups of farmers

**Final Examination: as announces by registrar**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Indicative Assessment:**

|  |  |
| --- | --- |
| **Assessment Item Details** | **Weighting Percentage** |
| **Midterm examination (1 hour)** | 30% |
| * **Group Tutorial Presentation (groups of 2-3 students),** * **Reading Synoptic maps (take a daily forecast)** * **Essay (proposal, 250 words and Essay, 2000 words)** * **Models (including discussion entries, 500 words)** * **Reviewing Two Scientific Articles** | 20% |
| **Final examination** | 50% |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**References:**

* Andrews, D.G., 2010. *An introduction to atmospheric physics*. Cambridge University Press.
* Murthy, V.R.K., 2002. *Basic principles of agricultural meteorology* (pp. 4-4). BS Publications.
* Rogers, D.P. and Tsirkunov, V.V., 2013. *Weather and climate resilience: Effective preparedness through national meteorological and hydrological services*. The World Bank.
* Gommes, R., Challinor, A., Das, H., Dawod, M.A., Mariani, L., Tychon, B., Krüger, R., Otte, U., Vega, R.E.R. and Trampf, W., 2010. *Guide to Agricultural Meteorological Practices.* *World Meteorological Organization*, (134).