EXTENDED LECTURE OUTLINES

AGM 311 Introduction to Agro-Meteorology (1+1)

1**. Meaning and scope of agricultural meteorology:** Definition, scope and importance of agrometeoroloy, branches of meteorology-physical meteorology, dynamic meteorology, experimental meteorology, applied meteorology, synaptic meteorology, micro meteorology and macro meteorology.

2. Earth's atmosphere: Atmosphere and its importance, extent and mass of the atmosphere, Structure of atmosphere - troposphere, stratosphere, mesosphere and thermosphere, composition of the atmosphere- importance of nitrogen, oxygen, carbon dioxide, Ozone, threat to ozone layer and ozone hole, solid particles in the atmosphere, organic and inorganic solid particles their composition and importance, water vapour-composition present in the atmosphere and its importance on rainfall and relative humidity , lithosphere, hydrospere.

3. Atmospheric weather variables: Definition, importance of different variables- temperature, air pressure and air density, precipitation, atmospheric humidity, wind speed and wind direction, definition of weather and climate, types of climates, factors affecting climate latitude, altitude, water bodies, vegetation, topography, classification of climate based on moisture index and temperature-based classification.

4. **Atmospheric pressure:** Pressure systems of world, Diurnal and seasonal variation, factors controlling atmospheric pressure, causes of variation in pressure- temperature, altitude, water vapour, rotation of earth and seasonal variation.

5.Wind and its types: Definition and types of wind- trade winds, westerlies, easterlies, jet streams, seasonal winds. Land breeze and sea breeze, cyclones, anticyclones, storms, hurricane, thunderstorms, waterspouts,tornadoes and tsunami. wind speed and direction. cyclones, anticyclones, wind and crops- importance and effect of wind on crops, shelter belts.

6. Sun and solar radiation: Solar radiation- light, short wave radiation, long wave radiation, electromagnetic spectrum, global radiation, insolation, net solar radiation, albedo, absorptivity, transmitivity, emissivity, black body radiation, Radiation balance, absorption of solar radiation, scattering, atmospheric window, energy balance, outgoing long wave radiation, radiation laws- plank's law, Kirchoff's law and Stefan–Boltzman's law, solar radiation and crops- importance of light intensity, duration, quality and direction of light, classification of plants based on response to light intensity, classification of crops based on duration of light, phto morphosis, light compensation point, photoperiodic induction, radiation use efficiency.

7. **Atmospheric temperature:** Definition, temperature inversion, laps rate, heat, latent heat, sensible heat, transfer of heat- conduction, convection and radiation, factors responsible for temperature variation, diurnal variation of air temperature, horizontal air temperature distribution, vertical air temperature distribution, temperature inversion, heat unit concept, or growing degree concept, heat injuries, cold injuries and role of temperature in crop production, thermo periodic response, cardinal temperature, soil temperature, importance of soil temperature, factors affecting soil temperature, variations in soil temperature- daily variation of soil temperature and seasonal variations of soil temperature.

8. Atmospheric humidity: Humidity and its definition, relative humidity, absolute humidity, specific humidity, mixing ratio, dew point temperature, diurnal variation in relative

humidity, effect of humidity on crop production, concept of saturation, vapour pressure process, process of condensation, formation of dew, fog, mist, frost, clouds.

9. Precipitation: Process of precipitation, types of precipitation- convectional rains, orographic rains and cyclonic rains, development of rainfall, types of precipitation-convectional rains, orographic rains and cyclonic rains, forms of precipitation such as rain, snow, sleet and hail.

10. Cloud formation and classification: Definition of cloud and classification of clouds-high end clouds (cirrus, cirrocumulu, and cirrostraturs), middle height clouds (altocumulus, alto-stratus and nimbo-stratus) low height clouds (strato cumulus, stratus) and clouds of vertical development (cumulus and cumulonimbus). Forms of precipitation such as rain, snow, sleet and hail.

11. Artificial rain making: Principles of rain making, cloud seeding, types of cloud seeding-cold cloud seeding- dry ice seeding and silvers iodide seeding and warm cloud seeding- water drop technique and common salt technique and precipitation processes.

12. Monsoon: Definition of monsoon, mechanism of monsoon, types of monsoons-south west monsoon and north east monsoon, winter rainfall and summer rainfall, Significance monsoon in Indian agriculture.

13. Weather hazards: Definition of Floods, frost, tropical cyclones and extreme weather conditions such as heat wave and cold wave, drought, types of droughts- hydrological drought, agriculture drought, meteorological drought, seasonal drought, physiological drought, difference between aridity and drought, reasons for drought occurrence.

14. Agriculture and weather relations: Role of weather on agriculture, modifications of crop microclimate, types of microclimate modifications.

15. Weather forecasting: Climatic normals, definition of weather forecast, types of weather forecast- short range, medium range and long-range forecast and their uses, synoptic charts, weather calendar and weather normals for agricultural crops.

17. Climate change and variability: Definition of climate change and variability, causes for climate change and its impact on regional and national agriculture, atmospheric pollutants-air pollutants (sulfur dioxide, nitrogen oxide, carbon monoxide and volatile organic compounds), particulate organic matter**,** secondary pollutants **(**chlorofluorocarbons, ammonia, radioactive pollutants and odour), minor air pollutants include, anthropogenic (man-made) sources, and its effect on climate and crop production, climate change, the effects of air pollution on agricultural crops, significance of climate change, effect of climate change at global level, impact of climate change on Indian agriculture, global warming-causes for global warming and effect of greenhouse gases, mitigation strategies and adaptation.