Department of Agricultural Meteorology and Physics

Ph.D Programme

Course No.	Title of the course	Credits
	1st semester	
AGM -701	Hydrometeorology	2+1
AGM -702	Monsoon Meteorology	2+0
AGM -703	Principles of Remote Sensing and Its Applications in Agriculture	2+1
	2nd semester	
AGM- 751	Environmental Physics for Agricultural Meteorology	3+0
AGM-752	Seminar-I	0+1
	3rd semester	
AGM -801	Agro meteorological Aspects of Evapotranspiration	2+0
AGM -802	Meteorological Aspects of Agricultural Drought	1+1
	4th semester	
AGM-692	Seminar - II	0+1
	5th semester	
	Nil	
	6th semester	
SWC-999	Seminar-III	1+0
SWC-1000	Doctoral Research	0+45

AGM 701 Hydrometeorology   2+1

UNIT I: Hydrologic cycle and its modification; rainfall and its interception by plants and crops.

Interpolation and measurement of missing rainfall data; adequacy of rain gauges; average rainfall on an

area depth basis; presentation and processing of precipitation data.

UNIT II: Measurement of runoff, infiltration, moisture retention of soil, percolation, evaporation, evapotranspiration and its importance to agriculturists, irrigation engineers and flood forecasting personnel; water holding capacity of soils, plant available water, cultural practices on soil moisture in relation to different phases of crop growth; evaporation from snow, lakes, reservoirs and crop fields.

UNIT III: Classifying rainfall data into class interval; ranking of rainfall data; relationship between intensity and duration; methods of predicting runoff rate; factors affecting runoff; rainfall-runoff relation; estimation of evapotranspiration from water balance methods; response of crops to water stresses under different agro climatic situation on India.

UNIT IV: Moisture availability indices and their application for Indian condition; wet and dry spell by Markov-chain model; drought and its classification, hydrological drought, drought indices and their applications under Indian conditions.

Practical: Analysis of rainfall data. Determination of effective rainfall.To estimate missing rainfall data for a given station.To find out the optimum number of rain gauges for a given catchment.To find out the mean rainfall for a given drainage basin by Thiessen polygon method and isohyetal method.To estimate the volume of runoff by SCS method.Estimation of evopotranspiration from field based water balance method.

AGM 702 Monsoon Hydrology   2+0

UNIT I:Monsoon and its origin; global pressure distribution; major wind systems and their seasonal variability; monsoon as a global phenomenon; Asiatic monsoon; Indian monsoon and its seasonal aspects: south-west monsoon, north-east monsoon, western disturbances, onset, advancement and retreat of monsoon in different parts of India, regional features, orographic influences; inter annual variability of monsoon; role of Walker and Hadley cell.

UNIT II: El Nino, La Nina, southern oscillation index and their impact on monsoon; synoptic weather systems affecting Indian monsoon and their short and medium range forecasting; tropical cyclone: its genesis and forecasting; monsoon experiments (MONEX) and numerical modeling; long range forecasting of Indian monsoon rainfall, Parametric model, Auto regression integrated moving average (ARIMA) model.

AGM 703 Principles of Remote Sensing and Its Application in Agriculture   2+1

UNIT I:Basic components of remote sensing- signals, sensors and sensing systems; active and passive remote sensing.

UNIT II: Characteristics of electromagnetic radiation and its interaction with matter; spectral features of earth's surface features; remote sensors in visible, infrared and microwave regions.

UNIT III: Imaging and non-imaging systems; framing and scanning systems; resolution of sensors; sensor platforms, their launching and maintenance.

UNIT IV: Data acquisition system, data preprocessing, storage and dissemination; digital image processing and information extraction.

UNIT V: Microwave remote sensing; visual and digital image interpretation; introduction to GIS and GPS.

UNIT VI: Digital techniques for crop discrimination and identification; crop stress detection - soil moisture assessment, inventory of ground water and satellite measurement of surface soil moisture and temperature; drought monitoring, monitoring of crop disease and pest infestation.

UNIT VII: Soil resource inventory; land use/land cover mapping and planning; integrated watershed development; crop yield modeling and crop production forecasting.

UNIT VIII: Estimation of evapotranspiration through satellite imageries – MODIS, TERRA, AQUA, AVHRR, NOVA etc.; modeling for potential ET & reference ET, and ET through remote sensing.

Practical: Acquisition of maps. Field data collection. Map and imagery scales. S/W and H/W requirements and specifications for remote sensing. Data products, their specifications, media types, data inputs, transformation, display types, image enhancement. Image classification methods. Evaluation of classification errors. Crop discrimination and acreage estimations. Differentiation of different degraded soils.Time domain reflectometry. Use of spectrometer and computation of vegetation indices. Demonstration of case studies. Hands on training. Computation evapotranspiration by remote sensing.

AGM 751   Environmental Physics for Agricultural Meteorology 3+0

UNIT I: Thermodynamics of the atmosphere. Physics of radiation: origin and nature of radiation, radiation geometry in Cartesian, spherical cylindrical coordinate systems, conservation principles for radiant energy; fluid motion: laminar and turbulent transfer, fluctuation theory for turbulent transfer of momentum, heat and water vapour.

UNIT II:Physics of evaporation: aerodynamic approach, energy balance approach and combination approach for evaporation estimates.

UNIT III: Physics of soil water system: the concept of potential as applied to soil water system, total potential and components, movements of water on soil, fundamental equation, hydraulic conductivity, infiltration, field drainage and water vapour movement in soil.

UNIT IV: Physics of water use: a physical introduction to plant-water system and relationships, water transport through soil-plant-atmosphere systems, measurement of crop water use in terms of water conservation equation.

AGM 801 Agro Meteorological Aspects of Evapotranspiration   2+0

UNIT I: Theories of evaporation and evapotranspiration: aerodynamic energy balance and Combined approaches; application of evapotranspiration theories; concept of potential, reference and actual evapotranspiration; impact of microclimate, crop and soil on status of evapotranspiration; modification of evapotranspiration rate through management practices; techniques of lysimetry in measuring actual evapotranspiration; crop coefficient and its significance in computation of evapotranspiration demand.

UNIT II: Yield functions, water use efficiency and scheduling of irrigation based on evapotranspiration; infrared thermometry in relation to evapotranspiration status of crop field; simulation of evapotranspiration by using empirical and mechanistic models; evapotranspiration and growth relation; regional scale crop planning on the basis of soil water balance.

AGM 802 Meteorological Aspects of Agricultural Drought   1+1

UNIT I: Introduction; definition of drought: based on rainfall, temperature, soil water, crop parameter, climate, indices and ET estimates; meteorological indices of agricultural drought; methods of drought analysis: statistical analysis of rainfall and water balance approach; the plant agricultural practices and drought; types of drought and their causes; local environmental control of drought: modification of wind, radiation, rain, evaporation and soil moisture.

UNIT II: Types of agricultural drought in India; contingent crop planning for drought management; need for a world climate watch on drought; prediction of drought: crop stress detection, crop water stress index; air pollution stress and its influence on vegetation.

Practical: Frequency distribution of dry spell of different length. Estimation of deciles of rainfall. Different soil water balance techniques for drought estimation. Estimation of Palmer drought indices. Development of index of drought proneness through Markov chain model. Estimation of agricultural drought by different approaches. Estimation of atmospheric drought by different approaches.