

**Course Title: Current Trends in Agronomy**  
**Course Code: Agron 601**  
**Credit Hours: (3+0)**

**Theory**

**Unit I**

Agro-physiological basis of variation in yield, recent advances in soil-plant-water relationship.

**Unit II**

Globalization of agriculture and WTO, precision agriculture, contract farming, organic farming, marketing and export potential of organic products, certification, labeling and accreditation procedures and ITK in organic farming.

**Unit III**

Crop residue management in multiple cropping systems; latest developments in plant management Mechanization in crop production: modern agricultural precision tools and technologies, weed management, cropping systems, grassland management, agro-forestry, allelopathy.

**Unit IV**

GIS, GPS and remote sensing for crop management, global warming, GM crops, seed production technology; seed certification, seed multiplication, hybrid seed production, etc.

**Unit V**

Concepts of system agriculture; holistic approach of farming systems, dryland farming, sustainable agriculture and research methodology in Agronomy. Conservation agriculture, principles, prospects and importance, potential benefits of CA under climate change scenario, policy issues.

**Suggested Reading**

- Agarwal RL. 1995. *Seed Technology*. Oxford & IBH.
- Dahiya BS and Rai KN. 1997. *Seed Technology*. Kalyani.
- Govardhan V. 2000. *Remote Sensing and Water Management in Command Areas: Agroecological Prospectives*. IBDC.
- ICAR. 2006. *Hand Book of Agriculture*. ICAR.
- Narasaiah ML. 2004. *World Trade Organization and Agriculture*. Sonali Publ.
- Palaniappan SP and Annadurai K. 2006. *Organic Farming - Theory and Practice*. Scientific Publ.
- Sen S and Ghosh N. 1999. *Seed Science and Technology*. Kalyani.
- Tarafdar JC, Tripathi KP and Kumar M. 2007. *Organic Agriculture* Scientific Publ.
- Kumar, R, Swarnkar KS, Singh KS and Narayan S. 2016. *A Text Book of Seed Technology*. Kalyani Publication. Reddy SR and Prabhakara G. 2015. *Dryland Agriculture*. Kalyani Publishers.
- Gururajan B, Balasubhranian R and Swaminath V. 2013. *Recent Strategies on Crop Production*. Kalyani Publishers.
- Venkateswarlu B and Shanker Arun K. 2009. *Climate change and agriculture: Adaptation and mitigation strategies*. *Indian Journal of Agronomy* 54(2): 226-230.

**Course Title: Recent Trends in Crop Growth and Productivity**  
**Course Code: Agron 602**  
**Credit Hours: (3+0)**

**Theory**

**Unit I**

Plant density and crop productivity; plant and environmental factors, yield, plant distribution, strategies for maximizing solar energy utilization; leaf area; interception of solar radiation and crop growth; photosynthesis: the photosynthetic apparatus, factors essential for photosynthesis; difference in photosynthetic rates among and within species; physiological limitations to crop yield; solar radiation concept and agro-techniques for harvesting solar radiation.

**Unit II**

Growth analysis: concept, CGR, RGR, NAR, LAI, LAD, LAR; validity and Limitations in interpreting crop growth and development; growth curves: sigmoid, polynomial and asymptotic; root systems; root-shoot relationship; principles involved in inter and mixed cropping systems under rainfed and irrigated conditions; concept and differentiation of inter and mixed cropping; criteria in assessing the yield advantages.

**Unit III**

Competitive relationship and competition functions; biological and agronomic basis of yield advantage under intercropping; physiological principles of dry land crop production, constraints and remedial measures; heat unit concept of crop maturity: concept and types of heat units.

**Unit IV**

Concept of plant ideotypes: crop physiological and new ideotypes; characteristics of ideotype for wheat, rice, maize, etc.; concept and types of growth hormones; their role in field crop production; efficient use of resources.

**Practical**

- Field measurement of root-shoot relationship in crops at different growth stages
- Estimation of growth evaluating parameters like CGR, RGR, NAR, LAI etc., at different stages of crop growth.
- Computation of harvest index of various crops.
- Assessment of crop yield on the basis of yield attributing characters
- Construction of crop growth curves based on growth analysis data
- Computation of competition functions, viz. LER, IER aggressivity competition index etc. in intercropping
- Senescence and abscission indices
- Analysis of productivity trend in un-irrigated areas
- Analysis of productivity trend in irrigated areas

**Suggested Reading**

- Chopra VL and Paroda RS. 1984. *Approaches for Incorporation of Drought and Salinity Resistance in Crop Plants*. Oxford & IBH.
- Delvin RM and Vitham FH. 1986. *Plant Physiology*. CBS Publ.
- Evans LT. 1975. *Crop Physiology*. Cambridge Univ. Press.

- Evans LT. 1996. *Crop Evolution, Adaptation and Yield*. Cambridge Univ. Press.
- Gupta US. (Ed.). 1995. *Production and Improvement of Crops for Drylands*. Oxford & IBH.
- Gupta US. 1988. *Progress in Crop Physiology*. Oxford & IBH.
- Kramer PJ and Boyer JS. 1995. *Water Relations of Plant and Soils*. Academic Press.
- Mukherjee S and Ghosh AK. 1996. *Plant Physiology*. Tata McGraw Hill.
- Narwal SS, Politycka B and Goswami CL. 2007. *Plant Physiology: Research Methods*. Scientific Pub.
- Tiaz L. and Zeiger E. 2006. *Plant Physiology*. Sinauer Associates, Inc.

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**Course Title: Irrigation Management**

**Course Code: Agron 603**

**Credit Hours: (2+1)**

**I. Theory**

**Unit I**

Global water resources; Water resources of India, irrigation projects during pre and post independence period and their significance in crop production; irrigation needs, atmospheric, soil, agronomic, plant and water factors affecting irrigation need; water deficits and crop growth.

**Unit II**

Movement of water in soil-water movement under saturated and unsaturated conditions, Poiseuille's and Darcy's law, general equation of saturated and unsaturated flow of water in soil.

Soil-plant-water relationships, evaporation, transpiration and evapo-transpiration, significance of transpiration, energy utilization in transpiration, physiological processes and crop productivity.

**Unit III**

Water requirement, irrigation needs, factors affecting irrigation need; water use efficiency, Infiltration; water movement under saturated and unsaturated conditions; management practices for improving water use efficiency of crops.

**Unit IV**

Soil and plant water potential, SPAC, transpiration and evapotranspiration, significance of transpiration, energy utilization in transpiration, factors affecting ET, control of ET by mulching and use of anti-transpirants; fertilizer use in relation to irrigation.

**Unit V**

Crop water stress – water deficits and crop growth, adoptability to the crops. Water availability with relation to nutrient availability.

**Unit VI**

Application of irrigation water, conveyance and distribution system, irrigation efficiency; agronomic considerations in the design and operation of irrigation projects; characteristics of irrigation and farming systems affecting irrigation management.

**Unit VII**

Strategies of using limited water supply; factors affecting ET, control of ET by mulching and use of anti-transpirants; fertilizer use in relation to irrigation; optimizing the use of given irrigation supplies.

**Unit VIII**

Land suitability for irrigation, land irrigability classification; integrated water management in command areas, institution of water management in commands, farmer's participation in command areas; irrigation legislation.

**Unit IX**

Economic analysis of irrigation and crop planning for optimum use of irrigation water

**Unit X**

Crop water production function

### **Practical**

- Determination of water infiltration characteristics and water holding capacity of soil profiles.
- Determination Moisture extraction pattern of crops
- Determination of water balance component of transplanted rice by drum culture technique
- Determination of consumptive use and water requirement of a given cropping pattern
- Determination of crop efficient of one important crop
- Planning, designing and installation of drip irrigation system
- Planning, designing and installation of sprinkler irrigation system
- Designing of drainage channel
- Measurement of irrigation efficiencies
- Determination of irrigation timing under different methods of irrigation
- Visit to irrigation command area

### **Suggested Reading**

- MP. Singh 2017. Recent advances in Irrigation water management. Kalyanipublishers
- FAO. 1984. *Irrigation Practice and Water Management*. Oxford & IBH.
- Michael AM. 1978. *Irrigation: Theory and Practice*. Vikas Publ.
- Mishra RR and Ahmad M. 1987. *Manual on Irrigation and Agronomy*. Oxford & IBH.
- Panda SC. 2003. *Principles and Practices of Water Management*. Agrobios.
- Reddy SR. 2000. *Principles of Crop Production*. Kalyani.
- Sankara Reddy GH and Yellamananda Reddy. 1995. Efficient Use of Irrigation Water. In: Gupta US. (Ed.). *Production and Improvement of Crops for Drylands*. Oxford & IBH.
- Singh SS. 2006. Principles and Practices of Agronomy. In: Gupta US.(Ed.). *Production and Improvement of Crops for Drylands*. Oxford & IBH

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**Course Title: Integrated Farming Systems and Sustainable Agriculture**  
**Course Code: Agron 605**  
**Credit Hours: (2+0)**

**Theory**

**Unit I**

Integrated Farming systems (IFS): definition, scope and importance; classification of IFS based on enterprises as well as under rainfed/irrigated condition in different land situation. farming systems according to type of rotation, intensity of rotation, degree of commercialization, water supply, enterprises.

**Unit II**

Concept of sustainability in of Integrated farming systems; efficient Integrated farming systems based on economic viability and natural resources - identification and management.

**Unit III**

Production potential of different components of Integrated farming systems; interaction and mechanism of different production factors; stability of Integrated Farming system based on research/long term information. in different systems through research; eco-physiological approaches to intercropping. Integration of components and adaptability of different farming system based on land situations and climatic condition of a region; evaluation of IFS.

**Unit IV**

Simulation models for intercropping; soil nutrient in intercropping; preparation of different farming system models; evaluation of different farming systems. Formation of different Integrated Farming system Models; evaluation of different Integrated Farming system models. Recycling of organic waste in farming system, in IFS.

**Unit V**

New concepts and approaches of farming system and organic farming; value addition, waste recycling, quantification and mitigation of Green House gases; case studies/success stories of different Integrated Farming systems. cropping systems and organic farming; case studies on different farming systems. Possible use of ITK in Integrated farming system.

**Suggested Reading**

- Ananthkrishnan TN. (Ed.). 1992. *Emerging Trends in Biological Control of Phytophagous Insects*. Oxford & IBH.
- Baishya A, Borah M, Das AK, Hazarika J, Gogoi B and Borah AS 2017. *Waste Recycling Through Integrated Farming systems. An Assam Agriculture Experience*. Omni Scriptum Gmbh & Co. KG, Germany.
- Balasubramanian P and Palaniappan SP. 2006. *Principles and Practices of Agronomy*. Agrobios.
- Edens T. 1984. *Sustainable agriculture and integrated farming system*. Michigan State Univ. press.
- Jayanthi C. 2006. *Integrated Farming systems-A way to sustainable Agriculture*. Tamil Nadu Agricultural University, Coimbatore
- Joshi M and Parbhakarasetty TK. 2005. *Sustainability through Organic Farming*. Kalyani.

- Kolhapure A and Madhukar D. *A text book of farming system and sustainable agriculture.*
- Palaniappan SP and Anandurai K. 1999. *Organic Farming - Theory and Practice.* Scientific Publ.
- Panda SC. 2004. *Cropping systems and Farming Systems.* Agribios.
- Lampin N. 1990. *Organic Farming.* Farming Press Books.
- Ravisankar D and Jayanthi C. 2015. *Farming systems: concepts and approaches.* Agrobios

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**Course Title: Stress Crop Production**  
**Course Code: Agron 607**  
**Credit Hours: (2+1)**

**Theory**

**Unit I**

Strain Terminology ; Naure and Stress Injury and resistance ; causes of stress.

**Unit II**

Low temperature stress : Freezing injury and resistance in plants, measurement of freezing tolerance , chilling injury and resistance in plants ,practical ways to overcome the effect of low temperature stress through soil and crop manipulations.

**Unit III**

High temperature or heat stress: meaning of heat stress, heat injury and resistance in plants, practical ways to overcome the effect of heat stress through soil and crop manipulations.

**Unit IV**

Water deficit stress: meaning of plant water deficient stress and its effect on growth and development, water deficit injury and resistance, practical ways to overcome effect of water deficit stress through soil and crop, manipulations.

**Unit V**

Excess water or flooding stress: meaning of excess water stress, its kinds and effects on crop plants, excess water stress injury and resistance, practical ways to overcome excess water stress through soil and crop manipulations.

**Unit VI**

Salt stress: meaning of salt stress and its effect on crop growth, salt stress injury and resistance in plants, practical ways to overcome the effect of salt stress through soil and crop manipulations.

**Unit VII**

Mechanical impedance of soil and its impact on plant growth; measures to overcome soil mechanical impedance.

**Unit VIII**

Environmental pollution: air, soil and water pollution, and their effect on crop growth and quality of produce; ways and means to prevent environmental pollution.

**Practical**

- Determination of electrical conductivity of plant cell sap
- Determination of osmotic potential and tissue water potential
- Measurement of transpiration rate
- Measurement of stomatal frequency
- Measurement of Relative Water Content of leaf
- Measurement of electrolytic leakage
- Growing of plants in sand culture under salt stress for biochemical and physiological studies
- Studies on effect of osmotic and ionic stress on seed germination and seedling growth
- Measurement of low temperature injury under field conditions
- Studies on plant responses to excess water



### **Suggested Reading**

- Baker FWG.1989. *Drought Resistance in Cereals*. Oxon, UK.
- Gupta US. (Ed.). 1988. *Physiological Aspects of Dryland Farming*. Oxford & IBH.
- Kramer PJ.1983. *Water Relations of Plants*. Academic Press.
- Levitt J. 1980. *Response of Plants to Environmental Stresses*. Vols. I, II. Academic Press.
- Mavi HS.1978. *Introduction to Agro-meteorology*. Oxford & IBH. Michael AM and Ojha TP.1981. *Principles of Agricultural Engineering*. Vol II. JainBros.
- Nilsen ET and Orcut DM. 1996. *Physiology of Plants under Stress – Abiotic Factors*. John Wiley & Sons.
- Singh K. 2000. *Plant Productivity under Environmental Stress*. Agribios.
- Singh KN and Singh RP. 1990. *Agronomic Research Towards Sustainable Agriculture*. Indian Society of Agronomy, New Delhi.
- Somani LL and Totawat KL. 1992. *Management of Salt-affected Soils and Waters*. Agrotech Publ.
- Virmani SM, Katyal JC, Eswaran H and Abrol IP. 1994. *Stressed Ecosystem and Sustainable Agriculture*. Oxford & IBH.

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**Course Title: Research and Publication Ethics**  
**Course Code: Agron 608**  
**Credit Hours: (0+2)**

**Theory**

**Unit I**

Introduction to philosophy: definition, nature and scope, concept, branches

**Unit II**

Ethics: definition, moral philosophy, nature of moral judgements and reactions

**Unit III**

Scientific conduct: Ethics with respect to science and research, intellectual honesty and research integrity, Scientific misconducts- falsifications, fabrications and plagiarism (FFP): Redundant publications: duplicate and overlapping publications, salami slicing; selective reporting and misrepresentation of data

**Unit IV**

Publication ethics: Definition, introduction and importance. Best practices/standardsetting initiatives and guidelines: COPE, WAME, etc., conflicts of interest. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, type, violation of publication ethics, authorship and contributorship, Identification of publication misconduct, complaints and appeals, predatory publishers and journals.

**Unit V**

Open access publishing: open access publication and initiatives: SHERPA, RoMEO online resource to check publisher copy right and self archiving policies; software tool to identify predatory publications developed by SPPU, Journal finder/journal suggestions tools viz., JANE, Elsevier Journal Finder, Springer Journal Suggester etc.

**Unit VI**

Publication misconduct: Group discussions- subject specific ethical issues, FFP, authorship, conflicts of interest, complaints and appeals examples and fraud from India and abroad. Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools

**Unit VII**

Database and Research metrics: Indexing data base, citation database, web of science, scopus, etc. Impact factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score; Metrics: h-index, g-index, i10-index altmetrics.

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