Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Agriculture
Ph.D. (Ag.) Agronomy

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		Theory			Practical		Credits		
		END SEM University Exam	Mid term exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	L	P	Total
PHDAGRON603	Irrigation Management	60	00	40	30	20	2	1	3

1. Legends: L - Lecture**; P –** Practical
**2. ***Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class.

Objective

To teach students about optimization of irrigation in different crops under variable agro climatic conditions.

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, Poiseulle'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. Crop water stress – water deficits and crop growth, adoptability to the crops. Water availability with relation to nutrient availability, economic analysis of irrigation and cop planning for optimum use of irrigation water, crop water production function

UNIT IV

Soil and plant water potential, SPAC, transpiration and evapo-transpiration, significance of transpiration, energy utilization in transpiration, factors affecting ET, control of ET by mulching and use of anti transpirents; fertilizer use in relation to irrigation, optimizing the use of given irrigation supplies.

UNIT V

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, 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.

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. Kalyani Publishers
- 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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PHDAGRON 606	Soil Conservation and Watershed Management	60	00	40	30	20	2	1	2

1. Legends: L - Lecture**; P –** Practical

**2. ***Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class.

Objective

To teach about different soil moisture conservation technologies for enhancing the agricultural productivity through holistic approach watershed management.

Theory

UNIT I

Soil erosion: definition, nature and extent of erosion; types of erosion, factors affecting erosion.

UNIT II

Soil conservation: definition, methods of soil conservation; agronomic measures contour cultivation, strip cropping, cover crops; mulching, tillage, cropping system vegetative barriers; improved dry farming practices; mechanical measures - bunding, gully control, bench terracing; role of grasses and pastures in soil conservation; wind breaks and shelter belts.

UNIT III

Watershed management: definition, objectives, concepts, approach, components, steps in implementation of watershed; development of cropping systems for watershed areas.

UNIT IV

Land use capability classification, alternate land use systems; agro-forestry; ley farming; jhum management - basic concepts, socio-ethnic aspects, its layout.

UNIT V

Drainage, methods of drainage, Drainage considerations and agronomic management; rehabilitation of abandoned jhum lands and measures to prevent soil erosion.

Practical

- Study of different types of erosion
- Determination of dispersion ratio
- Estimation of soil loss by Universal Soil Loss Equation
- Estimation of soil loss by wind erosion
- Measurement of runoff and soil loss
- Field studies of different soil conservation measures
- Laying out run-off plot and deciding treatments
- Identification of different grasses and trees for soil conservation

• Visit to watershed areas
• Visit to a soil conservation research centre, demonstration and training centre

Suggested Reading

- Arakeri HR and Roy D. 1984. Principles of Soil Conservation and Water Management. Oxford & IBH.
- Dhruvanarayana VV. 1993. Soil and Water Conservation Research in India. ICAR.
- FAO. 2004. Soil and Water Conservation in Semi-Arid Areas. Soils Bull., Paper 57.
- Frederick RT, Hobbs J, Arthur D and Roy L. 1999. Soil and Water Conservation: Productivity and Environment Protection. 3rd Ed. Prentice Hall
- Gurmel Singh, Venkataraman CG, Sastry B and Joshi P. 1990. Manual of Soil and Water Conservation Practices. Oxford & IBH.
- Murthy VVN. 1995. Land and Water Management Engineering. Kalyani.
- Tripathi RP and Singh HP. 1993. Soil Erosion and Conservation. Wiley Eastern.
- Yellamanda Reddy T and Sankara Reddy GH. 1992. Principles of Agronomy. Kalyani.

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PHDSOILS 604	Soil Genesis and Micromorphology	50	40	10	00	00	2	0	2

1. Legends: L - Lecture**; P –** Practical

**2. ***Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class.

Objective

To impart knowledge about the pedogenic processes in soils and to acquaint with the micro-pedological study of soil profile.

Theory

UNIT I

Pedogenic evolution of soils; soil composition and characterization.

UNIT II

Weathering and soil formation–factors and pedogenic processes; stability and weathering sequences of minerals.

UNIT III

Assessment of soil profile development by mineralogical and chemical analysis.

UNIT IV

Micro-pedological features of soils–their structure, fabric analysis, role in genesis and classification.

UNIT V

Micro-pedological features of soils–role in genesis and classification.

Suggested Reading

• Brady NC and Weil RR. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
• Buol EW, Hole ED, MacCracken RJ & Southard RJ. 1997. Soil Genesis and Classification. 4th Ed. Panima Publ.
• Dixon JB and Weed SB. 1989. Minerals in Soil Environments. 2nd Ed. Soil Science Society of America, Madison.
• Grim RE. 1968. Clay Mineralogy. McGraw Hill.
• Indian Society of Soil Science 2002. Fundamentals of Soil Science. ISSS, New Delhi.
• Sehgal J. 2002. Introductory Pedology: Concepts and Applications. New Delhi
• Sehgal J. 2002. Pedology - Concepts and Applications. Kalyani.
• USDA. 1999. Soil Taxonomy. Hand Book No. 436. 2nd Ed. USDA NRCS, Washington.
• Wade FA and Mattox RB. 1960. Elements of Crystallography and Mineralogy.

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PHDSST 601	Hybrid Seed Production Technology	60	00	40	30	20	2	1	3

1. Legends: L - Lecture**; P –** Practical

**2. ***Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class.

Objective

To provide students a comprehensive knowledge and practical exposure on hybrid seed production techniques in agricultural and horticultural crops

Theory

UNIT I

Introduction – history – scope – importance of hybrid development – national and international scenario of seed industry – popular public sector hybrids in various crops. Heterosis – definition – expression – types – utilization of heterosis in hybrid development, hybrid vigour and seed vigour.

UNIT II

Types of hybrids – intra-specific, inter-specific hybrids, single, double, three way cross, top cross hybrids – apomixes; generation system of seed multiplication in different types of hybrids. Development and maintenance of inbred lines – male sterile – maintainer lines – fertility restoration – transgenic hybrids – principles and method of development.

UNIT III

Breeding tools – genetic mechanism – male sterility – types: CMS, GMS, CGMS, TGMS, PGMS – barnase and barstar system – pistillateness – self incompatibility. Manual creation of male sterility – emasculation and pollination – gametocides – mode of action, mechanism. Synchronization of flowering – problems – methods to achieve synchrony – planting ratio and supplementary pollination methods.

UNIT IV

Techniques of hybrid seed production in major agricultural crops – cereals (wheat, rice), millets (maize, sorghum, bajra), pulses (red gram), oilseeds (sunflower, castor, mustard), cotton and forage crops

UNIT V

Hybrid seed production techniques in horticultural crops – tomato, brinjal, chilli, bhendi, onion, bitter gourd, bottle gourd, ridge gourd, cucumber, melon, cabbage, cauliflower, potato, coconut and papaya

Practical

• Characteristics features of parental lines and their hybrids;
• Floral biology of rice, maize, pearlmillet, sunflower, castor and cotton;
• Study on floral biology of vegetable crops – solanaceous and other vegetables;
• Study on floral biology of cucurbitaceous crops;
• Production and maintenance of A, B and R lines;
• Practicing planting design and border rows – rice, maize, pearlmillet, sunflower and red gram; brinjal and chillies;
• Practicing planting design and border rows in tomato, cotton and cucurbitaceous vegetables;
• Manipulation for synchronization – rice, sunflower, pearlmillet and sorghum;
• Practicing supplementary pollination – rice and sunflower;
• Practicing field inspection in hybrid seed production plot – crops planted in ratio – sunflower, pearlmillet, sorghum, etc.;
• Practicing field inspection in hybrid seed production field – red gram, castor, cotton, cucurbits and tomato;
• Practicing roguing and identification of off-types – pollen shedders – shedding tassel – selfed fruits; • Visit to hybrid seed production fields;
• Visit to potato seed production plots;
• Determination of cost benefit of hybrid seed production;
• Visit to seed Industry and assessing problems and perspectives in hybrid seed production.

Suggested Readings

- Agarwal RL. 2012. Seed Technology. 3rd Ed. Oxford & IBH Publishers, New Delhi.
- Basra A. 1999. Heterosis and Hybrid Seed Production in Agronomic Crops. CRC Press., Florida, United States.
- Chhabra AK. 2006. Practical Manual of Floral Biology of Crop Plants. Department of Plant Breeding, CCSHAU, Hisar.
- Dar SH. 2018. Methods of Hybrid Seed Production in Major Crops. Educreation Publishing, Chhattisgarh.
- Frankel R and Galun E. 1977. Pollination Mechanisms, Reproduction and Plant Breeding. Springer Verlag, New York.
- Hebblethwaite PD. 1980. Seed Production. Butterworth Heinemann Ltd., London, UK.
- Joshi AK and Singh BD. 2004. Seed Science and Technology. Kalyani Publishers, New Delhi.
- Krishnan M. 2012. Plant breeding and Hybrid Seed Production. Domin and Publishers & Distributors, New Delhi, India.

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PHDSST 602	Organic Seed Production	60	00	40	30	20	1	1	2

1. Legends: L - Lecture**; P –** Practical

**2. ***Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class.

Objective

To make students to understand the concept of organic farming, principles and practices of organic seed production, certification and marketing.

Theory

UNIT I

Organic farming – definition, genesis, concepts and principles; importance of organic farming and organic seed; organic seed – strategies, problems and perspectives – organic seed vs conventional seed; organic seed production – factors influencing seed production – soil health – GMO elements of seed.

UNIT II

Techniques of organic seed production – selection of land – pre requisite for seed production – conversion period – soil amendments – green manures; multi-varietal seed techniques – organic sources of manures – bulky, concentrated and liquid manures, biofertilizers and biocontrol agents – organic seed treatment.

UNIT III

Organic weed management practices – manual and mechanical methods – mulching – thermal weed control; growth promoting substances – panchakavya, fish amino acid, etc.; organic plant protection measures – herbal insecticides – IPM strategies; post harvest techniques – drying, processing and grading; organic seed treatment and storage.

UNIT IV

Organic certification application – registration – verification of records; organic seed certification – tagging; role of organizations in production and marketing of organic seed – national and international organizations involved – public, private – NGOs – International Federation of Organic Agriculture Movement (IFOAM) – basic standards and EU regulations – organic seed marketing.

UNIT V

Crop specific organic seed production and post harvest seed management techniques for major food crops, vegetables and fruit crops – economics of organic seed production and demand for organic seed

Practical

• Studying the field and seed standards for organic seed production;
• Collection and identification of organic manures and liquids;

• Preparation of organic products for soil application;
• Preparation of panchakavya, starter solutions and vermiwash;
• Organic priming of seeds with panchakavya and vermiwash;
• Preparation of leaf extracts and starter solutions and preparation of organic products for foliar application;
• Studying the effect of organic nutrients and foliar sprays on seed quality;
• Preparation of organic products for seed treatment and studying the effect on seed quality;
• Assessing the storage behaviour of organically treated seeds;
• Selection of suitable container and dry leaves or shrubs for enhanced storability;
• Organic treatment for management of seed health;
• Production and assessment of bio control agents for effective pest control;
• Economics of organic seed production and assessing demand;
• Visit to organic farm and seed production field;
• Visit to Department of organic certification;
• Visit to organic retail shops.

Suggested Reading

1. Bryan Connolly B, Langer J and Lawn CR. 2011. Organic Seed Production and Saving: The Wisdom of Plant Heritage. Chelsea Green Publishing, Vermont, USA.
2. Gehlot D. 2010. Organic Farming: Components and Management. Agrobios., Jodhpur, India.
3. Gehlot D. 2012. Organic Farming: Standards, Accreditation, certification and Inspection. Agrobios., Jodhpur, India.
4. Panda SC. 2012. Soil Management and Organic farming, Agrobios., Jodhpur, India.
5. Panda SC. 2013. Principles and Practices of organic Farming. Agrobios., Jodhpur, India.
6. Suresh N and Deshmukh. 2010. Organic Farming: Principles, Prospects and Problems. Agrobios., Jodhpur, India.
7. White JM. 1995. Organic Vegetable Production. UF/IFAS Coop. Ext. Serv., HS720., Florida, United States.

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