



Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Agriculture

B. Sc.(Hons) Agriculture

**BAG 501: Principles of Integrated Pest and Disease Management**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
<b>BAG 501</b>	Principles of Integrated Pest and Disease Management	50	30	00	15	05	2	1	3

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

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

**Objectives:** To study the concepts & principles of integrated pest & disease management in crop production.

**Outcomes:**

- i. Student should be able to detect the insect pest & plant diseases along with its level of incidence.
- ii. Student should know the integrated pest & disease management with respect to forecasting & use of bio-control agents.

**Unit-1:** Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases.

**Unit-2:** Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.

**Unit-3:** Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management.

**Unit-4:** Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest and disease).



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**Unit-5:** Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.

### **Practical: BAGL 501**

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM, Identification of bio-control agents, different predators and natural enemies. Mass multiplication of *Trichoderma*, *Pseudomonas*, *Trichogramma*, NPV etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agro-ecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases .Awareness campaign at farmers fields.

### **References**

1. Singh, R. S.2002.Introduction to Principles of Plant Pathology. Oxford& IBH Publishing Co. Pvt.Ltd. ,New Delhi.
2. Dhaliwal, G. S.and Ramesh Arora 2001.Integrated pest management: Concepts and approaches, Kalyani Publishers, Ludhiana
3. VenugopalaRao, N. ,Umamaheswari, T. , Rajendraprasad, P. , Naidu, V. G.andSavithri, P. 2004.Integrated Insect Pest Management, Agrobios ( India) Limited, Jodhpur.
4. Chaube, H. S.andRamji Singh.2001.Introductory Plant Pathology.International Book Distribution Co. ,Lucknow.136.

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**BAG502: Manures, Fertilizers and Soil Fertility Management 3(2+1)**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	End Sem University Exam	Teachers Assessment*			
BAG502	Manures, Fertilizers and Soil Fertility Management	50	30	00	15	05	2	1	3

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

**Course Objective:** To study the about soil fertility, fertilizers manures, and management of soil fertility

**Course Outcomes:**

1. Student will able to understand the how to management of soil fertility
2. Student will able to understand method of fertilizer application

**Unit-1:**Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

**Unit-2:**Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

**Unit-3:**History of soil fertility and plant nutrition. criteria of essentiality. Role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.

**Unit-4:**Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests.

**Unit-5:**Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.



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**Practical: BAGL 502**

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. Estimation of soil organic carbon, Estimation of alkaline hydrolysable N in soils. Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils .Estimation of soil extractable S in soils. Estimation of DTPA extractable Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.

**Books:**

1. <http://www.agrimoon.com/manures-fertilizers-agrochemicals-pdf-book/>
1. Soil Fertility and Nutrient Management ( 2011) by S.S.Singh, Kalyani Publishers, New, Delhi
2. FAO: Fertilizer and their use 4 TH Ed.

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**BAG503.Pests of Crops and Stored Grains and their Management**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
<b>BAG503</b>	Pests of Crops and Stored Grains and their Management	50	30	00	15	05	2	1	3

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

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

**Objectives:** To study the nature & damage of crop pests & stored products along with its management.

**Outcomes:**

1. On the basis of symptoms, student should be able to identify the pest of crops & stored products
2. Student should be able to manage the pest infestation.

**Unit-1:** General account on nature and type of damage by different arthropods pests.

**Unit-2:** Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests.

**Unit-3:** scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments.

**Unit-4:** Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management.

**Unit-5:** Storage structure and methods of grain storage and fundamental principles of grain store management.



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**Practical: BAGL 503**

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food. , Delhi. Visit to nearest FCI godowns.

**References**

1. Butani, D. K. and Jotwani, M. G. 1984. Insects in Vegetables. Periodical Export Book Agency, New Delhi.
2. Butani, D.K. 1984. Insects and Fruits. Periodical Export Book Agency, New Delhi.
3. Dennis S Hill 1987 Agricultural Insect Pests of tropics and their control, Cambridge University Press, New York
4. Khare, S. P. 1993. Stored Grain Pests and Their Management. Kalyani Publishers, Ludhiana.
5. Nair MRGK. 1986. Insects and Mites of crops in India. Indian Council of Agricultural Research New Delhi.
6. Vasantharaj David, B. 2003. Elements of Economic Entomology. Popular Book Depot, Coimbatore.
7. Vasantharaj David, B and Anantha krishnan, T. N. 2006. General and Applied
8. Entomology. Tata McGraw-Hill Publishing House, New Delhi.
9. Upadhyaya K. P. and Kusum Dwivedi. 1996. A Text Book of Plant Nematology. Aman Publishing House, Meerut.

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**BAG504:Diseases of Field & Horticultural Crops & their Management-I**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
BAG504	Diseases of Field & Horticultural Crops & their Management-I	50	30	00	15	05	2	1	3

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

**Course Objective:** To study the about major diseases of Horticultural crops and their management

**Course Outcomes:**

1. Student will able to identified the horticulture crops diseases
2. Student will able to understand how to management the diseases of horticulture crops

**Unit-1:** Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khairaandtungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose, Bajra :downy mildew and ergot; Groundnut: early and late leaf spots, wilt

**Unit-2:** Symptoms, etiology, disease cycle and management of major diseases of following crops: Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot

**Unit-3:** Symptoms, etiology, disease cycle and management of major diseases of following crops: black& green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic.

**Unit-4:** Symptoms, etiology, disease cycle and management of major diseases of following crops: Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight;

**Unit-5:** Symptoms, etiology, disease cycle and management of major diseases of following crops: Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic;



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Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

**Practical: BAGL 504**

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens.

**Books:**

1. Reddy, P. P. Plant protection in horticulture vol.1-3
2. Rangaswami, G.K. Mahadevan. 2001. Diseases of crop plants in India. Prentice Hall of India Pvt.Ltd, New Delhi
3. Singh, R. S. 2005. Plant Diseases. Oxford & IBH Publication, New Delhi
4. Kalita, M. K. Diseases of field and horticulture crops and their management-I

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**BAG505: Crop Improvement – I (Kharif)**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
BAG505	Crop Improvement – I (Kharif)	50	30	00	15	05	1	1	2

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

**Course Objective:** Basic knowledge of kharif crops and its crop improvement approach

**Course Outcome:**

1. Student will be able to understand major plant breeding approach of kharif crops
2. Student will be able to understand hybrid seed production technology of kharif crops

**Unit-1:** Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops;

**Unit-2:** Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters;

**Unit-3:** Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops;

**Unit-4:** Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional);

**Unit-5:** Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

**Practical: BAGL 505**

Floral biology, emasculation and hybridization techniques in different crop species; viz. , Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. Maintenance breeding of different



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*kharif*crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in *Kharif* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

**References:**

1. Text book of Field crops by Mukund Joshi
2. Science of crop product, Vol 1 : Kharif Crops Dr. G.S. Tomar, Dr. S.K. Taunk& Dr. J.L. Choudhary

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**BAG506: Entrepreneurship Development and Business Communication**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
BAG506	Entrepreneurship Development and Business Communication	50	30	00	15	05	1	1	2

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

**Course Objective:** To introduce students about Entrepreneurship Development and Business Communication.

**Course Outcomes:**

1. Students will be capable in the identification and development of managerial level talent.
2. Students will be able to create their own business.

**Unit-1:** Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation.

**Unit-2:** Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agri-enterprises, Entrepreneurial Development Process;

**Unit-3:** Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills),

**Unit-4:** Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation;

**Unit-5:** Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.



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**Practical: BAGL 506**

Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.

**References:**

1. Entrepreneurship Development, Vasant Desai, Himalaya Publishing House, New Delhi.
2. Entrepreneurship Development and Communication Skills, R. R.Khole, P. S.Kapse and P. R.Deshmukh, Scientific Publisher, India.
3. Fundamentals of Entrepreneurship, Mohanty S. K.2009, Prentice Hall of India Pvt.Ltd. ,New Delhi.
4. Entrepreneurial Development, Khanka S. S. , 1999, S.Chand and Co.

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**BAG507: Geo-informatics, Nano-technology and Precision Farming 2(1+1)**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
BAG507	Geo-informatics, Nano-technology and Precision Farming	50	30	00	15	05	1	1	2

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

**Course Objective:** To introduce students about Geoinformatics focuses on the theory and practice of the design and development of GIS and analytical methods that are typically required in a variety of applications including Precision Agriculture (PA).

**Course Outcomes:**

1. Applying the geo-informatics technology for agriculture development would be useful for agricultural management and monitoring of crops, quality control management for agricultural products, and planning of cultivation.

**Unit-1:** Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.

**Unit-2:** Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS;

**Unit-3:** Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions;

**Unit-4:** Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture;



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**Unit-5:** Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

**Practical: BAGL 507**

Introduction to GIS software, spatial data creation and editing. Introduction to image processing software. Visual and digital interpretation of remote sensing images. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use of GPS for agricultural survey. Formulation, characterization and applications of nano-particles in agriculture. Projects formulation and execution related to precision farming.

**References:**

1. Krishna, K.K. 2013. Precision Farming: Soil Fertility and Productivity Aspects. Apple Academic Press
2. Srivastava, G.S. 2014. An Introduction to Geoinformatics. McGrew Hill Education (India) Pvt. Ltd. , New Delhi
3. Gupta, R.K. and Subhash Chander. 2008. Principles of Geoinformatics. Jain Brothers, New Delhi.
4. Choudhary, S. 2011. Applied Nanotechnology in Agriculture. Arise Publishers & Distributors
5. Sekhon, B.S. 2014. Nanotechnology in agri-food production: an overview. Nanotechnology, Science and Applications 7:31-532.

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**BAG508: Practical Crop Production – I (Kharif crops)**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
BAG508	Practical Crop Production – I (Kharif crops)	0	0	00	60	40	0	2	2

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

**Course Objective:** To study about package and practices of Kharif crops

**Course Outcomes:**

1. Student will able to understand the preparation field for raising crop
2. Student will able to understand the package and practices of Kharif crops

**Practical: BAGL 508**

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

**Books:**

1. <http://www.agrimoon.com/practical-crop-production-pdf-book/>
2. jainL.K.manual on fundamentals of agronomy
3. Das, N R practical manual on basic agronomy with theory 2 nd Ed

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**BAG509: Intellectual Property Rights**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment#	END SEM University Exam	Teachers Assessment#			
BAG509	Intellectual Property Rights	50	40	10	0	0	1	0	1

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

**Objectives:** To get aware about intellectual property rights of agriculture techniques with respect to different acts & regarding agencies involved in it.

**Outcomes:**

- i. The student should be able to know the importance, need & procedure of licensing & patenting of agricultural innovations under IPR.

**Unit-1:** Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.

**Unit-2:** Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.

**Unit-3:** Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

**Unit-4:** Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders.

**Unit-5:** Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

**References**

1. Acharya, N. K. 2014. Text book of Intellectual Property Rights. Asia Law House, Hyderabad.
2. Loganathan, E. T. 2012. Intellectual Property Rights. New Century Publications, New Delhi.
3. Rosedar, S. R. A. 2016. Intellectual Property Rights. Lexis Nexis (2nd Ex. ) Nagpur

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B. Sc.(Hons) Agriculture

**BAG 510: Bio-pesticides & Bio-fertilizers [Elective course]**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
<b>BAG510</b>	Bio-pesticides & Bio-fertilizers	<b>50</b>	<b>30</b>	<b>00</b>	<b>15</b>	<b>05</b>	<b>2</b>	<b>1</b>	<b>3</b>

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

**Course objective:** Students will be given knowledge about bio-pesticides and bio fertilizers its uses and utility in crop husbandry.

**Outcome:**

1. Students will have awareness of bio-pesticides and bio fertilizers. Methods of preparation and application.
2. Students will have awareness about the importance of bio pesticides and bio fertilizers over commercial chemical pesticides and fertilizers.

**Unit-1:** History and concept of bio-pesticides. Importance, scope and potential of bio-pesticide. Definitions, concepts and classification of bio-pesticides viz. pathogen, botanical pesticides, and bio-rationales. Botanicals and their uses.

**Unit-2:** Mass production technology of bio-pesticides. virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of bio-pesticides. Methods of quality control and Techniques of bio-pesticides. Impediments and limitation in production and use of biopesticide.

**Unit-3:** Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers-*Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*;Cynobacterial biofertilizers- *Anabaena*, *Nostoc*, *Hapalosiphon* and fungal biofertilizers- AMmycorrhiza and ectomycorrhiza.

**Unit-4:**Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production echnology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers.



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**Unit-5:**FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

### **BAGL 510:Practical**

Isolation and purification of important bio-pesticides: *Trichoderma Pseudomonas, Bacillus, Metarhizium* etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomo pathogenic entities in field condition. Quality control of bio-pesticides. Isolation and purification of *Azospirillum* , *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria. Mass multiplication and inoculums production of biofertilizers. Isolation of AMfungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

### **Reference books:**

1. Biofertilizers and Biocontrol Agents for Organic Farming, Dr. ReetaKhosla
2. Biofertilizers and Biopesticides, by Krishnendu Acharya (Author), SurjitSen (Author), ManjulaRai (Author)
3. Biofertilizers and Biopesticides (English, Hardcover, Channabasava A., H. C. Lakshman)
4. Biofertilizers and Biopesticides, Dr. ShaliniSuri

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**BAG 511: Hi-tech. Horticulture [Elective course]**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
<b>BAG 511</b>	<b>Hi-tech. Horticulture</b>	<b>50</b>	<b>30</b>	<b>00</b>	<b>15</b>	<b>05</b>	<b>2</b>	<b>1</b>	<b>3</b>

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

**Course objective:** To make students aware of the advanced technology used in Horticulture farming.

**Outcome:**

1. Students will get awareness about the use of modern machines and protective structures
2. Students will be familiar with new methods of farming bringing in use remote sensing, GIS etc..

**Unit-1:** Introduction& importance; Nursery management and mechanization; micro propagation of horticultural crops;

**Unit-2:** Modern field preparation and planting methods, Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components;

**Unit-3:** EC, pH based fertilizer scheduling, canopy management, high density orcharding, Components of precision farming;

**Unit-4:** Remote sensing, Geographical Information System (GIS),Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA),

**Unit-5:** Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

**BAGL 511: Practical**

Types of poly-houses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-portrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.



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**Reference books:**

1. Hi-tech Horticulture, by Somuri Prasad (Author), Dharm Singh (Author), R.L. Bhardwaj (Author)
2. Hi- tech Horticulture, By DK Singh
3. Hi-Tech Horticulture, S Prasad, D Singh And R Bharadwaj

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**BAG 512: Protected Cultivation [Elective course]**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
<b>BAG 512</b>	Protected Cultivation	<b>50</b>	<b>30</b>	<b>00</b>	<b>15</b>	<b>05</b>	<b>2</b>	<b>1</b>	<b>3</b>

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

**Course objective:** This course will create awareness on production of horticultural crops under protected structure. Students will develop skill to erect protected structure according to the requirement.

**Outcome:**

1. Understand the principles and theoretical aspects of protected cultivation.
2. Develop skills in erection of protected structures and cultivation of horticultural crops.
3. Familiarize with importance and scope of protected cultivation

**Unit-1:** Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate.

**Unit-2:** Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation.

**Unit-3:** Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management.

**Unit-4:** Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lillium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

**Unit-5:** Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.



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**Practical: BAGL 512**

Raising of seedlings and saplings under protected conditions, use of portrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, Fogging and misting.

**Text & References:**

1. Mears DR, Kim MK & Roberts WJ. 1971. Structural Analysis at an Experimental Cable supported Air Inflated Green Houses. Trans. ASAE.
2. Pant V Nelson. 1991. Green House Operation and Management. Bali Publ.
3. Chandra S & Som V. 2000. Cultivating Vegetables in Green House. Indian Horticulture 45: 17- 18.
4. Prasad S & Kumar U. 2005. Greenhouse Management for Horticultural Crops. 2nd Ed. Agrobios.
5. Tiwari GN. 2003. Green House Technology for Controlled Environment. Narosa Publ. House.

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**BAG 513: Micro propagation Technologies [Elective course]**

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment*	END SEM University Exam	Teachers Assessment*			
BAG 513	Micro propagation Technologies	50	30	00	15	05	2	1	3

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

**Course objective:** To make the students aware of the principles, practices and application of the plant tissue culture.

**Outcome:**

1. Understand the use of different plant tissue culture (PTC) techniques for PTC Industries as well as research.
2. To identify the tools for gene identification and its functional analysis.

**Unit-1:** Introduction, History, Advantages and limitations;

**Unit-2:** Types of cultures (seed, embryo, organ, callus, cell),

**Unit-3:** Stages of micro propagation, Axillaries bud proliferation (Shoot tip and meristem culture, bud culture),

**Unit-4:** Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures,

**Unit-5:** Production of secondary etabolites, Somaclonal variation, Cryopreservation

**Practical: BAGL 513**

Identification and use of equipment in tissue culture Laboratory, Nutrition media composition, sterilization techniques for media, containers and small instruments, sterilization techniques explants, Preparation of stocks and working solution, Preparation of working medium, Culturing of explants: Seeds, shoot tip and single node, Callus induction, Induction of somatic embryos regeneration of whole plants from different explants, Hardening procedures.



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**Reference Books:**

1. Chawla, H. S. (2000). Introduction to plant biotechnology. Enfield, NH: Science.
2. Razdan, M. K. (2003). Introduction to plant tissue culture. Enfield, NH: Science.
3. Slater, A., Scott, N. W., & Fowler, M. R. (2003). Plant biotechnology: The genetic manipulation of plants.
4. Buchanan, B. B., Gruissem, W., & Jones, R. L. (2015). Biochemistry & molecular biology of plants. Chichester, West Sussex: John Wiley & Sons.
5. Slater, A., Scott, N. W., & Fowler, M. R. (2008). Plant biotechnology: An Introduction to Genetic Engineering. Oxford: Oxford University Press.
6. Primrose, S. B., & Twyman, R. M. (2006). Principles of gene manipulation and genomics. Malden, MA: Blackwell Pub.

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