POST-GRADUATE DEGREE PROGRAMME SEMESTER SYSTEM - RULES AND REGULATIONS (M. Sc. in Agriculture)

1. SYSTEM OF EDUCATION

1.1 The rules and regulations provided here in shall govern all the Post Graduate programmes (i.e) Master Degree offered by the Lucknow University, Lucknow.

1.2. The semester system shall be followed for all the Post-Graduate degree programmes.

1.3 The duration of master's programmes is two (4 semesters) academic years. The first year of study shall be the first and second semesters following student's admission. The second year of study shall be the third and fourth semesters.

2. DEFINITIONS

2.1 ó**Academic year'** means a period consisting of two consecutive semesters including the inter-semester break as announced by the Principal/Dean, Faculty of Science/Agriculture.

2.2 ó**Co-ordinator'** means a teacher of a department who has been nominated by the Principal of the college with the approval of Dean, Faculty of Science/ Agriculture of the university to coordinate the post graduate programs in the department. The co-coordinator looks after registration, time table, regulation of credit load, preparation of class grade charts, maintenance of individual studentôs files, etc.

2.3 ó**Curriculum**ô is a group of courses and other specified requirements for the Fulfillment of the post graduate degree programme.

2.4 ó**Curricula and syllabi'** refer to list of approved courses for post graduate degree programme wherein each course is identified with a three-letter code, a course number, outline of the syllabus, credit assigned and schedule of classes.

2.5 ó**Course'** is a teaching unit of a discipline to be covered within a semester as detailed in the curricula and syllabi issued by the University, consisting of core, optional and supporting courses.

2.6 ó**Credit load'** of a student during a semester is the total number of credits registered by that student during that particular semester.

A credit in theory means one hour of classroom lecture and a credit in practical means two and half hours of laboratory / workshop / field work per week.

2.7 ó**Grade Point'** means the total marks in percentage divided by 10 and rounded off to two decimal places.

2.8 ó**Credit Point'** means the grade point multiplied by corresponding credit hours.

2.9 ó**Grade Point Average**ô **(GPA)** means the total credit points secured divided by total credit hours registered during a semester.

2.10 **'Overall Grade Point Average' (OGPA)** means the total credit points secured by a student for all semesters divided by total credit hours of the courses registered and rounded off to two decimals.

2.11 ó**Report card'** is the list of courses registered by a student during a semester along with credit points secured.

2.12 ó**Transcript card'** is the consolidated report of list of courses completed by the student along with credit points, GPA of each semester and OGPA secured and issued by the University.

3. POST GRADUATE PROGRAMMES

The list of various post-graduate programmes at Masters level offered in the University are as follows:

3.1.1 MASTER OF SCIENCE IN AGRICULTURE [M.Sc.(Ag.)]

(A)Horticulture

(B)Agricultural Extension

Academic Regulation

S.No.	Particulars	Master Degree
1.	**System of Education**	Semester
2.	**Semester Duration**	110 working days including examination
3.	**Duration of the program** (1) Minimum	4 Semesters (2 Academic Years)
3	**Eligibility for admission**	(1) Bachelorôs degree in respective/related subjects (2) 7.0/10 or equivalent OGPA /equivalent percentage of marks at Bachelorôs degree
4	**Mode of Admission** Weightage	Entrance -cum-Academic performance i) Entrance-60 % ii) Undergraduate-20% iii) 12th standard-10% iv) 10 standards-10%

5	**Minimum credit requirement** (as per ICAR Norms) (1) Course work Major* Supporting (outside discipline) Sub Total (2) Thesis/Project Work Total	 30 Credits 12 Credits 42 Credits 06 48 Credits
6	**Attendance requirement**	75%
7	**Examination** Final theory Midterm Practical Seminar	 External Internal Internal+External Internal
8	**Project Work by review** (i) Evaluation (Credit=03) (ii)Viva-Voce (Credit=03)	 External ï 1 Examiner Internal ï 1 Examiner
9	**Grading** (1) Scale (2) Minimum Passing Grade in a course (3) Minimum OGPA to obtain degree	 10 Points 5.5 Points 6.0 Points

4. ELIGIBILITY FOR ADMISSION

Candidates seeking admission to masters programme should have a four year bachelorôs degree from State Agricultural Universities (SAU) or from other universities recognized by UGC. Candidates seeking admission to various masters' programmes are permitted to apply only for any two subjects. A candidate who

possesses an OGPA 7.00 out of 10.00 (or) 60 per cent aggregate or more alone are eligible to apply for various Mastersô programmers.

Masters degree programmes	Subjects
1. Horticulture	B.Sc(Hort.)/B.Sc(Ag)
2 Agriculture Extension	B.Sc.(Ag.)

5. ADMISSION

Selected candidates should pay the prescribed fees before the due date. If any Student fails to pay the fees before the due date he/she shall forfeit the admission.

6. FEE STRUCTURE

At the time of admissions, the fees for the first semester and Second Semester (One Academic Year) should be paid at the Office of the College as prescribed time to time. Candidates who discontinue after admission are not eligible for refund of fees except caution money deposited. The mess dues clearance certificate has to be produced by all the students at the time of registration and final examination of each semester and thesis/Project submission.

7. LANGUAGE REQUIREMENT

The medium of instruction is English/ Hindi. The post graduate students should have adequate knowledge in English to read, write and speak in English and able to prepare high quality research papers in English. Foreign students whose knowledge in English is inadequate shall take an audit course in English offered by the department of Language.

8. ATTENDANCE REQUIREMENT

8.1 A student who fails to secure 75 per cent of attendance in each course separately for theory and practicals, shall not be permitted to appear for the final examination in that course and shall be awarded ôEô (incomplete) and will be required to repeat the course when offered with juniors.

8.2 In respect of the student who has absented himself / herself for classes with or without valid reasons, that period will be treated as absence only and not as leave. Also, no attendance will be given for writing make up tests.

In case of new admission, for calculating 75% attendance in the first semester, the number of working days will be calculated from the date of joining of the students who are permitted to join late due to administrative reasons.

9.0 Dropping Rules

As per Lucknow University P.G. Course Programme.

10. Repeat or Back Paper Rules

As per Lucknow University P.G. Ordinance of Course Programme.

11. EVALUATION OF STUDENT'S PERFORMANCE

All students shall abide by the rules for evaluating the course work under the semester system of education, as prescribed from time to time by the university.

11.1. Examinations

There will be two examinations viz. mid semester and final examination. Wherever the course has practical, there will be a final practical examination also.

11.1.1. The **mid semester examination** for the Post-graduate courses will be conducted for a period of two hours and final examinations in theory and practical will be conducted for three hours each.

The mid semester examinations will be conducted by course teachers during the ninth week of the semester in common examination hall.

11.1.2. The final theory examination shall be conducted after completion of 105 working days and normally after three days of study holidays. The final theory examination for masters program will be arranged by the Controller of Examinations by adopting a common time table.

11.1.3. The students who are late by 30 minutes shall not be allowed to appear in the Examination. Similarly no student will be allowed to leave the examination hall within 30 minutes after the commencement of the examination.

11.1.4. The distribution of marks will be as indicated below:

Examination	Mark Distribution
Mid-semester	20
Final theory	50
Final practical	30

11.1.5. The question paper model and distribution of marks for mid semester and final theory examinations are as follows.

Final Theory: 50 marks
Model paper as per Lucknow University P.G. Courses programme.

12. Calculation of G.P.A and O.G.P.A is illustrated here below:

S.No.	**Course**	**Cerdit**	**Mark obtained**			**Total**	**Grade**	**Grade Point**	**G.P.A**
			Mid term 20	Theory 50/80	Practical 30				
1	A	3(2+1)	16/20	38/50	26/30	80	8.0	24.0	7.94
2	B	2(2+0)	18/20	60/80	-	-	7.8	15.6	
3	C	2(0+2)	16/20	-	64/80	80	8.0	16.0	

1. Grade Point= Credit of Course x Grade of Course.
2. G.P.A. = Sum of the grade points of all courses/sum of the credit of all courses.
3. O.G.P.A = Sum of the G.P.A. of all Semester/No.of Semesters in M.Sc. (Ag).

13. Evaluation

Evaluation of student's performance shall be both internal and external where mid term test will be solely internal by course teacher and final theory examination solely arranged by the University whereas the practical examination will be conducted by a board consisting of two examiners *ie* the course incharge and another examiner appointed by the University.

14. The Academic performance of the students shall be adjudged in following manner.

Marks obtained %	Grade	Expression	Class/Division
70 and above	7.00-7.99	good	I
60-69	6.00-6.99	Fair	II
50-59	5.00-5.99	Pass in individual Sub.	III
Below-50	Below 5.00	Fail	Fail

Thus the minimum grade for passing a course shall be 5.5 and getting the degree of Master of Science in Agriculture however an O.G.P.A. of 6.0 shall be the minimum requirement. Provided further that for completion of the degree of M.Sc. (Ag). The maximum duration shall be 4 year/ 8 semesters.

COURSE FOR M. Sc. (Ag.) –HORTICULTURE

COURSE DETAILS:

CODE	COURSE TITLE	CREDITS
(A) MAJOR COURSES		**30**
AG. HORT 501	Tropical And Dry Land Fruit Production	3 (2+1)
AG. HORT 502	Production Technology Of Warm Season Vegetable Crops	3 (2+1)
AG.HORT 503	Landscaping And Ornamental Gardening	3 (2+1)
AG.HORT 504	Production Technology of Cool Season Vegetable Crops	3 (2+1)
AG. HORT 505	Subtropical And Temperate Fruit Production	3 (2+1)
AG. HORT 506	Post Harvest Management Of Horticultural Crops	3 (2+1)
AG. HORT 507	Growth And Development of Horticultural Crops	3(2+1)
AG.HORT 508	Production Technologies For Medicinal And Aromatic Crops	3 (2+1)
AG.HORT 509	Production Technologies of Cut Flowers	3 (2+1)
AG.HORT 510	Seminar	3 (0+3)
(B) SUPPORTING COURSES		**12**
AG.STAT & CA 501	Statistics and Computer Application	3 (2+1)
AG.ENTO 501	Insect Pests of Fruits, Vegetables, Spices and Medicinal Plants	3 (2+1)
AG.GPB 501	Genetic Engineering and Biotechnology	3 (2+1)
AG. PP 501	Diseases of Fruits and Ornamental crops	3 (2+1)
(C) Project Work		
AG.HORT -511	Project Work	**6(**3+3)

HORTICULTURE
SEMESTER WISE DISTRIBUTION:

CODE	COURSE TITLE	CREDITS
I- SEMESTER		**12**
AG. HORT 501	Tropical And Dry Land Fruit Production	3 (2+1)
AG. HORT 502	Production Technology Of Warm Season Vegetable Crops	3 (2+1)
AG.HORT 503	Landscaping And Ornamental Gardening	3 (2+1)
AG.ENTO 501	Insect Pests of Fruits, Vegetables, Spices and Medicinal Plants	3 (2+1)
II-SEMESTER		**12**
AG.HORT 504	Production Technology of Cool Season Vegetable Crops	3 (2+1)
AG. HORT 505	Subtropical And Temperate Fruit Production	3 (2+1)
AG. HORT 506	Post Harvest Management Of Horticultural Crops	3 (2+1)
AG.STAT& CA 501	Statistics and Computer Application	3 (2+1)
III-SEMESTER		**12**
AG. HORT 510	Seminar	3 (0+3)
AG. HORT 508	Production Technologies For Medicinal And Aromatic Crops	3 (2+1)
AG. GPB 501	Genetic Engineering and Biotechnology	3 (2+1)
AG. PP 501	Diseases of Fruits and Ornamental Crops	3 (2+1)
IV-SEMESTER		**12**
AG. HORT 507	Growth And Development of Horticultural Crops	3 (2+1)
AG.HORT 509	Production Technologies of Cut Flowers	3 (2+1)
AG. HORT -511	Project work	6 (3+3)

AG. HORT 501 : Tropical And Dry Land Fruit Production 3(2+1)

Theory

Commercial varieties of regional, national and international importance, eco-physiological requirements, recent trends in propagation, rootstock influence, planting systems, cropping systems. root zone, nutrient management, water management. fertigation, role of plant growth regulators, abiotic factors limiting fruit production, physiology of flowering, fruit set and development, pest and disease management. physiological disorders- systems, causes and remedies, quality improvement by management practices; maturity indices, harvesting,; industrial and export potential and Agri. Export Zones(AEZ).

Crops

UNIT I: Mango and Banana and Papaya
UNIT II: Guava, Sapota, Jackfruit and Citrus
UNIT III: Pineapple, Annonas, Avocado and Bael
UNIT IV: Aonla, Pomegranate, Phalsa and Ber

Practical

Identification of important cultivars, observations on growth and development, practices in growth regulation, malady diagnosis, and analyses of quality attributes, visit to tropical and arid zone orchards, Project preparation for establishing of commercial orchards.

AG. HORT 502: Production Technology Of Warm Season Vegetable Crops 3(2+1)

Theory

Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, plant protection measures, and seed production of:

UNIT I Tomato, egg plant, hot, sweet peppers and sweet potato
UNIT II Okra, beans, cowpea and cluster bean
UNIT III Cucurbitaceous crops and Tapioca
UNIT IV Green leafy warm season vegetables

Practical

Cultural operations (fertilizer application, sowing, mulching, irrigation, weed control) of summer vegetable crops and their economics; study of physiological disorders and deficiency of mineral elements, preparation of cropping schemes for commercial farms; experiments to demonstrate the role Of mineral elements, physiological disorders; plant growth regulators and herbicides; seed extraction techniques: Identification of important pests and diseases and their control; maturity standards economics of warm season vegetable crops.

AG.HORT 503: Landscaping And Ornamental Gardening 3(2+1)

Theory

UNIT I Landscape designs, types of gardens, English, Mughal, Japanese, Persian, Spanish, Italian, Vanams, Buddha garden; Styles of garden, formal, informal and free style gardens.

UNIT II Urban landscaping, Landscaping for specific situations, institutions, industries, residences, hospitals, roadsides, traffic islands, darn sites, IT parks, corporate offices.

UNIT III Garden plant components, arboretum, shrubbery, arches and pergolas, edges and hedges, climbers and creepers, cacti and succulents, herbs, annuals, flower borders and beds, ground covers; Production technology for selected annual ornamental plants.

UNIT IV Lawns, establishment and maintenance of vertical garden, roof garden, bog garden, sunken garden, rock garden. Planning, eco-tourism, indoor gardening, xeri-scaping, hard-scaping,

Practical

Identification and selection of ornamental plants for landscaping, practices in preparing designs for home gardens, institutional gardens, avenue planting, lawn making, planting herbaceous and shrubbery borders, project preparation on landscaping for different situations, visit to parks and botanical gardens, case study on commercial landscape gardens.

AG.HORT 504: Production Technology of Cool Season Vegetable Crops 3(2+1)

Theory

Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management, plant protection measures and seed production of:

Practical

UNIT I Potato and Bulb crops: onion and garlic
UNIT II Cole crops: cabbage, cauliflower, knol-khol, sprouting broccoli, Brussels sprout
UNIT III Root crops: carrot, radish, turnip and beetroot
UNIT IV Peas and French bean, cool season green leafy vegetables

Practical

Cultural operations (fertilizer application, sowing, mulching. irrigation, weed control) of winter vegetable crops and their economics; Experiments to demonstrate the role of mineral elements, plant growth regulators and herbicides; study of physiological disorders; preparation of cropping scheme for commercial farms; visit to commercial greenhouse/polyhouse.

AG. HORT 505: Sub-tropical And Temperate Fruit Production
3(2+1)

Theory

Commercial varieties of regional, national and international importance, eco-physiological requirements, recent trends in propagation, rootstock influence, planting systems, cropping systems, root zone and canopy management, nutrient management, water management, fertigation, bio-regulation, abiotic factors limiting fruit production, physiology of flowering, fruit set and development, abiotic factors limiting production, physiological disorders-symptoms, causes and remedies, quality improvement by management practices; maturity indices, harvesting, grading, packing, pre-cooling, storage, transportation and ripening techniques; industrial and export potential, Agri-Export Zones(AEZ) and industrial support.

Crops

UNIT I: Apple, pear and grapes and Nuts- walnut and almond
UNIT II: Plums, peach, apricot and cherries,
UNIT III: Litchi, Loquat, persimmon, Kiwifruit, strawberry
UNIT IV: Minor fruits- bael, fig and jamun

Practical

Idcntification of important cultivars, observations on growth and development, practices in growth regulation, malady diagnosis, analyses of quality attributes, visit to tropical, subtropical, humid tropical and temperate orchards, Protect preparation for establishing commercial orchards.

AG. HORT 506: Post Harvest Management Of Horticultural Crops
3(2+1)

Theory

UNIT I: Maturity indices, harvesting practices for specific market requirements, influence of pre harvest practices, enzymatic and textural changes, respiration and transpiration. Physiology and biochemistry of ripening and senescence, ethyler1e evolution and ethylene management, factors leading to post-harvest loss and pre-cooling.

UNIT II: Treatments prior to shipment, viz., chlorination, waxing, chemicals, bio-control agents and natural pant products. Methods of storage, ventilated refrigerated, MAP, CA storage, zero energy cool chamber, hypobaric storage, spoilage: microbial and bio-chemical, physical injuries and storage disorders.

UNIT III: Packing methods and transport, principles arid methods of preservation, processing and canning. Preparation of fruit juices, beverages, pickles, jam, jellies, candies and tomato products. Value addition and post harvest management of loose and cut flowers.

UNIT IV: Dried and dehydrated products, nutritionally enriched products. Fermented fruit beverages, packaging technology, management of processing wastes and food safety standards.

Practical

Analyzing maturity stages of commercially important horticultural crops, improved packing and storage of important horticultural commodities, physiological loss in weight of fruits and vegetables, estimation of transpiration, respiration rate, ethylene release and study of vase life extension in cut-flower using chemicals, estimation of quality characteristics in stored fruits and vegetables, cold chain management - visit to cold storage and CA storage units, visit to fruit and vegetable processing units, project preparation, evaluation of processed horticultural products.

AG. HORT 507 : Growth And Development of Horticultural Crops
3(2+1)

Theory

UNIT I: Cellular structures and their functions; definition of growth and development, growth analysis and its importance in horticultural crops.

UNIT II: Physiology or dormancy and germination of seeds, tubers and bulbs; Role of auxins, gibberellins, ctytokinins and abscissic acid;

UNIT III: Application of plant growth regulators, plant growth retardants and inhibitors for various purposes in horticultural crops; Role and mode of action of morph actins. anti-Tran spirants. anti-auxin, ripening retardant and plant stimulants in horticultural crop.

UNIT IV: Role of light, temperature and photoperiod on growth, development of underground parts, flowering and sex expression in horticultural crops; apical dominance.

Practical

Preparation of solutions of plant growth regulators and their application; experiments in induction and breaking of dormancy by chemicals; induction of parthenocarpy and fruit ripening; application of plant growth substances for improving flower initiation, sex modification, reduce flower and fruit drops and improving fruit set in horticultural crops.

AG.HORT 508: Production Technologies for Medicinal And Aromatic Crops 3(2+1)

Objective

To impart comprehensive knowledge about the production technology of medicinal and aromatic crops.

Theory

UNIT I: Export and import status. Indian system of use of medicinal plant, Indigenous Traditional Knowledge, IPR issues, Classification of medicinal crops, Systems of cultivation Organic production.

UNIT II: Production technology for Senna, Periwinkle, Coleus.swagandha, Glory lily, Sarpagandha, Dioscorea sp., Aloe Vera. ***Andrographis paniculata. :*** Production technology forlsabgol, Poppy, Safed musli, Stevia rebaudiana, Ocimum sp.

UNIT III: Post harvest handling of above mentioned medicinal plants and herbal products and phyto-chemical extraction techniques. Aromatic industry; Indian perfumery industry, History.Advancements in perfume industry.

UNIT IV: Production technology for palmarosa, lernongrass, citronella, geranium, arternisia, mentha, patchouli, lavender. Post-harvest handling of above mentioned aromatic crops.

Practical

Botanical description, Propagation techniques, Maturity standards, Digital documentation, Extraction of secondary metabolites, Project preparation for commercially important medicinal crops. Visit to medicinal crop fields, Visit to herbal extraction unit;. Extraction of Essential oils, Project preparation for commercially important aromatic crops, Visit to distillation and value addition unit.

AG.HORT 509: Production Technologies of Cut Flowers 3(2+1)

Theory

UNIT I: Scope of cut flowers in global trade, Global Scenario of cut flower production, Varietals wealth and diversity, area under cut flowers and production problems in India- Patent rights, nursery management, media for nursery, special nursery practices

UNIT II: Flower production water and nutrient management, fertigation, weed management At, rationing, training and pruning, disbudding, special horticultural practices, use of growth regulators, physiological disorders and remedies, IPM and IDM, production for exhibition purposes.

UNIT III: Flower forcing and year round flowering through physiological interventions, chemical regulation, environmental manipulation.

UNIT IV: Cut flower standards and grades, harvest indices, harvesting techniques, post-harvest handling. Methods of delaying flower opening. Pre-cooling, pulsing, packing, Storage & transportation, marketing, export potential, institutional support, Agri-Export Zones.
Crops: Cut rose, cut chrysanthemum, carnation, gerbera, gladioli, tuberose, orchids, dahlia, gypsophilla, statice, cut foliages and fillers.

Practical

Botanical description of varieties, propagation techniques, mist chamber operation, training and pruning techniques, practices in manuring, drip and fertigation, foliar nutrition, growth regulator application, pinching, disbudding, staking, harvesting techniques, post-harvest handling, cold chain, project preparation for regionally important cut flowers, visit to commercial cut flower units and case study.

SUPPORTING COURSES:

AG.STAT AND CA 501: STATISTICS AND COMPUTER APPLICATION 3(2+1)

Theory

Unit I: Agriculture statistics: Area, Production and Yield statistics; Agency and method of Collection of Area and yield statistics in U.P.; Crop Cutting experiment; Agriculture and Livestock Censuses; Sources of Official Agriculture statistics.

Unit II:. Planning and designing of experiments, Basic principles of Design of Experiments, uniformity trials, Fairfield Smithôs law, Shape and size of plots and blocks. Elements of linear estimation. Variance stabilizing transformations. Analysis of variance and covariance. Completely randomized, Randomized block and Latin square designs. Mutually orthogonal Lath squares

Unit III: Introduction to computer. A brief history of computing. Use, Definition, Anatomy, Components, Classification of Computers, Capabilities and limitation of a computer.

Unit IV: Introduction to MS-Office ï Word, Excel, Power Point and Fundamental of computer network ï LAN, MAN & WAN, Introduction of Internet, Email, surfing & browsing.

Practical: Crop cutting methods, CRD, RBD and Latin square designs, Introduction of MS Paint, MS Note pad, Introduction of MS Word, Excel, Power Point, Introduction of internet, Browser, E-mail.

AG.ENTO 501: INSECT PESTS OF FRUITS, VEGETABLAES, SPICES AND MEDICINAL PLANTS 3(2+1)

Theory

UNIT I: Detailed account of systematic position, identification, distribution, host range, nature of damage, life and seasonal history, natural enemies and management strategies of insect pests of fruits (mango, guava, jack fruit, citrus, papaya, banana, pomegranate, aonla, ber, jamun, phalsa, litchi, loquat, fig, grapevine, apple, peach, plum and pear)

UNIT II: Vegetables (cucurbits, okra, brinjal, tomato, potato, pea, cole crops)

UNIT III : Spices (onion, garlic, small cardamom, large cardamom, black pepper, turmeric, ginger, coriander, cinnamon)

UNIT IV: Medicinal plants (opium poppy, mentha, isabgol, safed musali, sarpgandha, ashwagandha, jatropha etc.).

Practical

Collection and identification of major insect pests and their natural enemies, field observations on damage caused by pests. Study of life cycle of two insect-pests one each from hemi and holo-metabolous group.

AG.GPB 501: GENETIC ENGINEERING AND BIOTECHNOLOGY 3(2+1)

Theory

UNIT I: Introduction to Plant Genetic Engineering and Biotechnology, gene identification, gene isolation, synthesis and gene cloning. Restriction enzymes and vectors. Regeneration in crop Plant. Gene transfer systems-vector mediated gene transfer, microinjection, electro oration, direct DNA uptake, gene gun technique.

UNIT II: Selectable markers and reporter system. Application of Plant Genetic Engineering and biotechnology-Transgenic crops- application of recombinant DNA technology- current status and future prospects. Regulation mechanism for genetically modified crops. Bio-safety issues of transgenic crops.

UNIT III: Molecular Breeding-morphological, biochemical and DNA based markers RFLP, RAPD, AFLP, SSLP etc.); Mapping populations (F2s, backcrosses, RILs, NILs and DHs). Molecular mapping and tagging of agronomically important traits. QTLs analysis in crop plants.

UNIT IV: Marker assisted selection for qualitative and quantitative waits. Gene pyramiding. Biotechnology application in male sterility hybrid breeding, Embryo rescue, somatic hybridization and double haploids. Biotechnology in PGR management.

Practical

In vitro techniques, nuclear, plasmid and bacteriophage, DNA isolation, Demonstration of in vitro regeneration. Demonstration and practice of important biotechnological techniques and transformation, isozyme analysis, molecular analysis using PCR technique, DNA fingerprinting, molecular marker and mapping population, visit to laboratories.

AG.PP 501 : DISEASES OF FRUITS AND ORNAMENTAL CROPS 3(2+1)

Theory

UNIT I: Symptomatology and life cycles of pathogen. Epidemiology and management of following diseases- Mango: malformation, anthracnose, powdery mildew and black tip.

UNIT II: Citrus: Phytophthora induced disease, canker Greening and Tristeza. Grapes; downy mildew. Guava: wilt. Papaya: stem rot, major foliar diseases (leaf curl and mosaic). Apple : Apple scab, Peach leaf curl.

UNIT III: Roses : Black spot, powdery mildews, rust, di back. Gladioli, carnation Wilt, Marigold: Damping off, leaf spats, flower bud rot, powdery mildew. Leaf spot, block rot, Anthracnose, viral diseases.

UNIT IV: Post harvest disease management in storage and transit of mango, guava and banana.

Practical

Diagnosis of pathogens in field and orchards, collection and preservation of specimen; survey for occurrence of post harvest diseases. Study of disease specimen: Downy and powdery mildews. Anthracnose and other leaf spots. Foliar diseases. Identification of pathogens. Role of fumigants against post harvest diseases.

COURSE FOR M. Sc. (Ag.) -AGRICULTURAL EXTENSION

COURSE DETAILS:

CODE	COURSE TITLE	CREDITS
(A) MAJOR COURSES		**30**
AG.EXT-501	Development Perspectives of Extension Education	3 (2+1)
AG.EXT -502	Development Communication and Information Management	3 (2+1)
AG.EXT -503	Diffusion and Adoption of Innovations	3 (2+1)
AG.EXT -504	Programme Planning, Monitoring & Evaluation	3 (2+1)
AG.EXT -505	Research Methods in Behavioural Science	3 (2+1)
AG.EXT -506	Fundamentals of Rural Sociology	3 (2+1)
AG.EXT -507	Entrepreneurship Development and Management in Extension	3 (2+1)
AG.EXT -508	Human Resource Development (HRD)	3 (2+1)
Ag.EXT-509	E-Extension	3 (2+1)
AG.EXT -510	Seminar	3 (0+3)
(B) SUPPORTING COURSES		**12**
AG.ECO.-501	Agriculture Marketing & Price Analysis	3 (2+1)
AG.ECO.-502	Agriculture Finance & Cooperation	3 (2+1)
AG.ECO-503	International Trade	3 (2+1)
AG.STAT & CA 501	Statistics and Computer Application	3 (2+1)
(C) Project Work		
AG.EXT -511	Project Work	**6** (3+3)

AGRICULTURAL EXTENSION
SEMESTER WISE DISTRIBUTION:

CODE	COURSE TITLE	CREDITS
I- SEMESTER		**12**
AG.EXT-501	Development Perspectives of Extension Education	3 (2+1)
AG.EXT -502	Development Communication and Information Management	3 (2+1)
AG.EXT -506	Fundamentals of Rural Sociology	3 (2+1)
AG.ECO.-501	Agriculture Marketing & Price Analysis	3 (2+1)
II- SEMESTER		**12**
AG.EXT -505	Research Methods in Behavioural Science	3 (2+1)
AG.EXT -504	Programme Planning, Monitoring & Evaluation	3 (2+1)
AG.ECO.-502	Agriculture Finance & Cooperation	3 (2+1)
AG.STAT & CA 501	Statistics and Computer Application	3 (2+1)
III- SEMESTER		**12**
AG.EXT -510	Seminar	3 (0+3)
AG.EXT -508	Human Resource Development(HRD)	3 (2+1)
AG.EXT -503	Diffusion and Adoption of Innovations	3 (2+1)
AG.ECO-503	International Trade	3 (2+1)
IV- SEMESTER		**12**
AG.EXT -507	Entrepreneurship Development and Management in Extension	3 (2+1)
Ag.EXT-509	E- Extension	3 (2+1)
AG.EXT -511	Project work	6(3+3)

AG.EXT-501: **Development Perspectives of Extension Education**

THEORY 3(2+1)

Unit I: AGRICULTURAL EXTENSION: Concept, meaning, definitions, objective, principles and philosophy, Role of agricultural extension in rural development, Education, Adult education and Distance education, teaching learning process.

Unit II: A brief account of Earlier Extension Efforts for development of rural India, Extension approaches and their comparative analysis with USA, UK, China and Israel.

Unit III: CURRENT APPROACHES IN EXTENSION: Institution Village Linkage Programme (IVLP), National Agricultural Innovation Project (NAIP), Training and Visit System (T&V System), Agricultural Technology Information Centre (ATIC), Kisan Call Centres, Krishi Vigyan Kendra, Farm Field School.

Unit IV: POVERTY ALLEVIATION PROGRAMMES: Swarnajayanti Gram Swarojgar Yojana (SGSY), Sampurn Gramin Rojgar Yojana (SGRY), Pradhan Mantri Gram Sadak Yoiana (PMGSY), Drought Prune Area Programme (DPAP), Council for Advancement of Peoples Action and Rural Technology(CAPART), Employment Generation Programmes like MNREGA, Panchayat Raj ect; Woman Development Programmes- like ICDS, MSY, etc. Problems in Rural Development.

PRACTICAL:

Visit to Gram Panchayat to study on going Rural Development Programmes. Visit to KVK, NGO and Extension centers of State Agricultural University and Departments. Bottom up Planning. Report preparation and presentations.

AG.EXT-502: **Development Communication and Information Management**

THEORY 3(2+1)

Unit I: COMMUNICATION PROCESS: Concept, definitions, elements and their characteristics, models and theories, types and functions of communication, communication process, feed back in communication, fidelity of communication, communication effectiveness and credibility, communication gap, Empathy, Homophily and heterophily, communication skill, criteria for selecting effective communication methods for extension, Barriers in communication, Message- meaning, dimensions of a message, characteristics of good message, Message treatment, distortion of message.

Unit II: METHODS OF COMMUNICATION: Meaning, definition, functions, classification, Forms of communication-oral and written communication, non- verbal communication, interpersonal communication, organizational communication

Unit III: Extension teaching methods and audio- visual aids: meaning, types, classification and their importance in communication of innovation. Factors affecting its selection in effective use.

Unit IV: Role of mass media in dissemination of farm technology, effect of media mix for rural people, modern communication media-electronic video, Tele-video conference.

PRACTICAL:
Listening skills, writing skills, preparation and presentation skill of communicator regarding communication media viz. visuals (poster, chart). Generating computer aided presentation- graphics, scanning of visuals and evaluation of visuals assignments.

AG.EXT-503: DIFFUSION AND ADOPTION OF INNVATION

THEORY
3(2+1)

Unit I: Innovation: Meaning of Innovation, innovativeness, perceived attributes of innovation. The Adoption Process: Meaning of adoption and adoption process, stages in adoption process, adopters categories, characteristics of adopters categories, rate of adoption, factors influencing rate of adoption.
Unit II: Diffusion: Meaning and definition of diffusion, diffusion process and its elements. Diffusion effect and concept of over adoption.
Unit III:, Multi steps flow of innovation, concepts of homophily and heterophily and their influence on flow of innovations.
Unit IV: Innovation Process: the innovation-decision process, types of innovation-decisions: optional, collective and authority and contingent innovation decisions, consequences of innovation-decisions-desirable or undesirable, direct or indirect, anticipated or unanticipated consequences.

PRACTICAL:
Identification of adopter categories on a selected technology. Study of attributes of current farm technologies. Field visit to study the recently diffused technology. Study of factors increasing or retarding the rate of adoption.

AG.EXT-504: PRGRAMME PLANNING, MONITORING AND EVALUATION

THEORY 3(2+1)

Unit I: PROGRAMME PLANNING: Meaning, Concept and definition of extension programme planning, its objectives, principles and importance in agriculture. Steps in sound extension programme planning.

Unit II: Process of developing sound extension pogramme. National planning system. Organizational structure for planning at various levels in India, five year plans in India.

Unit III: Panchayati Raj, changing role of panchayat in programme planning, implementation & evaluation.

Unit IV: MONITORING & EVALUATION: Meaning, definition, importance and steps involved in monitoring & evaluation.

PRACTICAL:

Preparation of plans and projects. Critical analysis of various agricultural and rural development programmes including NGOs and SHGs

AG.EXT-505: **Research Methods in Behavioural Science**

THEORY 3(2+1)

Unit I: Social Research: social research and research methods, scientific approach, characteristics and purpose of social research, Selection and identification of social research problems. Design of Social Research: Meaning, types, purpose and principles.

Unit II: Social Survey: Meaning, objectives, types, steps, advantages and limitations. Sampling: Meaning, basis for sampling, advantages and limitations, types of sampling and sampling procedures.

Unit III: Method of Data Collection: Meaning, definition, methods, purpose, advantage and limitations of observation, interview, case study, schedule, and questionnaire.

Unit IV: Measurement: Meaning, level of measurement, and its importance in research. Rating scales- meaning, types, limits in construction, advantage, Validity & Reliability: Meaning definition, types. Hypothesis: Meaning, types and qualities of workable hypothesis. Variables: Meaning, types and their role in research.

PRACTICAL:

Formation of research problem and conduct research including data collection, analysis, interpretation and report writing.

AG.EXT-506: FUNDAMENTALS OF RURAL SOCIOLOGY

3(2+1)

THEORY

Unit I: RURAL SOCIOLOGY: Concept, meaning, definitions, scope and importance, Basic sociological concepts - society, community and groups dynamics. Social groups- concepts and classification.

Unit II: Culture- concept, types, organizational structure, culture lag, ethnocentrism, acculturation, cultural continuity and cultural inertia. Cultural change, Technological change, Social change- Concept, dimension and factors of social change. Social stratification- concept and form, social process- concept and types. Social values and social norms.

Unit III: RURAL LEADERSHIP: Concept, types of rural leader, emerging pattern of rural leadership, Selection and theories of leadership. Identification of rural leaders.

Unit IV: BASIC PSYCHOLOGICAL CONCEPTS: Motivation, social interaction, social perception, emotion, Prejudice. Personality Development- Concept, types, dimensions, Factors affecting personality development and assessment of personality.

PRACTICAL:

Agricultural technological changes occurred in rural society. Socio-economic changes in rural society. Spotting rural leaders. Exploring social process operative in rural society.

AG.EXT-507: ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT IN EXTENSION

THEORY: 3(2+1)

Unit I: ENTREPRENEURSHIP DEVELOPMENT: Concept, definition, characteristics, theories, need for enterprises development. Agri-Entrepreneurship- concept, characteristic, nature and importance for sustainable livelihoods. Traits of entrepreneurs- Risk taking, leadership, decision making, planning, organizing, coordinating and marketing.

Unit II: Stages of establishing enterprise, Identification of sound enterprise, steps to be considered in setting up an enterprise, feasibility report, product selection, risk and market analysis.

Unit III: MANAGEMENT: Meaning, nature and importance, level of management. Extension Management- meaning, importance, principles of management, classification and functions of management. Planning ï concept, nature, importance, types, making planning effective. Decision making- concept, types of decisions, styles and techniques of decision making, Guidelines for making effective decisions.

Unit IV: ORGANIZATION, COORDINATION and SUPERVISION: Meaning principles, organizational structure of organization. Concept, need, types, techniques of coordination. Meaning, responsibilities, qualities and functions of supervision, essentials of effective supervision.

PRACTICAL:

Field visit to successful enterprises. Study of characteristics of successful entrepreneurs and their enterprise. Case study of success /failure enterprises. Field visit to extension organization to understand the functions of management. Entrepreneurship development institution of India. Exercise on process of enterprise development.

AG.EXT-508: HUMAN RESOURCE DEVELOPMENT (HRD)

THEORY:

Unit I: TRAINING AND EDUCATION: Concept, meaning, definition and relationship, determining training needs, training typology, training approaches and strategies; conceptual models; planning, designing, conducting, monitoring, evaluation and follow up of training;

Unit II: Training methods, preparation, selection and use; trainers training, techniques for trainee's participation; Training institutions in India and facilities available for training and HRD.

Unit III: HUMAN RESOURCE DEVELOPMENT: meaning, definition, importance, dimensions, priorities, scope and need for HRD; conceptual framework, interdisciplinary approach, basic assumptions underlying HRD, strategic interventions in HRD;

Unit IV: HRD policy of government of India, state development departments, ICAR, SAUs, and selected NGOs.

PRACTICAL:

Exercise on training needs assessments, training design and curriculum development, Visit to training and development institutions (KVKs, FTCs, TTCs, MANAGE and NAARM etc.); follow up of training conducted at field and block level.

AG.EXT 509: E-EXTENSION

2+1

Theory

UNIT I :ICTs- Concept, definition, tools and application in extension education. Reorganizing the extension efforts using ICTs, advantages, limitations and opportunities.

UNIT II : ICTs projects, case studies in India and developing world. Different approaches (models) to ICTs. ICT use in field of extension- Expert systems on selected crops and enterprises; Self learning CDs on package of practices, diseases and pest management, Agricultural web sites.

UNIT III: Community Radio, Web, Tele, and Video conferencing. Computer Aided Extension. Knowledge management, Multimedia. Online, Offline Extension., Mobile technologies, e-learning concepts.

UNIT IV :ICT Extension approaches-pre-requisites, information and science needs of farming community. Need integration. Human resource information. Intermediaries. Basic e-extension training issues.

Practical: Agril.content analysis of ICT Projects. Handling of ICT tools. Designing extension content. Online extension service. Project work on ICT enabled extension.

Supporting Courses:
AG.ECO.-501 Agriculture Marketing & Price Analysis

Theory: 3(2+1)

Unit I: Meaning, definition, scope, subject matter and importance of agricultural marketing, classification of markets, magnitude nature and extent of marketed and marketable surplus of agricultural commodities.

Unit II: Market functions and functionaries of agricultural marketing. Defects of agricultural marketing, regulated markets, role of regulated markets in agricultural marketing in India.

Unit III: Cooperative marketing, Primary Agricultural Cooperative Societies (PACS), NAFED, buffer stocks and import policies for agricultural produce, market structure, conduct and performance, marketing efficiency, market integration, horizontal and vertical.

Unit IV: Normal Price fluctuation, stabilization of agricultural prices, types and reasons for price movements, seasonal, cyclical, and irregular changes. Agricultural price policy and its objectives, price determination and support price policy, commission for agricultural costs and prices (CACP). Forward trading, Speculation and Hedging, Storage of Agricultural produce, CWC, SWC, Food Security.

Practical:

Problems based on marketing cost and margin, and price spread, producers share in consumers price, demand and supply of agricultural commodities.

AG.ECO.502 Agriculture Finance & Cooperation

Theory: 3(2+1)

Unit I: Capital and its classification and sources of capital, principles of capital investments, average rate of return, pay back period, internal rate of return, net present value and capital budgeting,

Unit II: concept of credit, its classification and role in agriculture and rural development. Methods of estimation of credit requirements. 3Rs of credit, 3Cs of credit and Ps of finance and their relation, credit worthiness and methods of estimation of repayment capacity.

Unit III: Principle of finance and financial management. Cooperation, its principles and role in agriculture and rural development. Causes of success and failure of cooperative movement in India. Different types of cooperative for agriculture and rural development. Evaluation of Rural credit policies in India and relative importance of various credit institutions. Review of various committee reports.

Unit IV: Credit Institutions ï Nationalized Banks, NABARD, RBI, World Bank, IMF and Asian development Bank. Success and failure stories of rural financial institutions pertaining to developed and developing countries.

Practical:

Problem based on 3-Rs- Return, Repayment Capacity & Risk Bearing Ability, Repayment of Loan of credit institutions. Estimation of credit needs. Analysis of average rate of return, payback periods, internal rate of return and net present value. Assessment of credit worthiness and repayment capacity.

AG.ECO-503: International Trade

3 (2+1)

Theory

UNIT I: International trade- basic concepts. The theory of international trade, absolute and comparative advantage, international trade equilibrium. Trade policy-protection, tariff and non-tariff measures, trade liberalization.

UNIT II: WTO/GATT. Supply side analysis; opportunity cost; trade under increasing opportunity costs; factor endowments; trade and factor prices; factor price equalization. Demand side analysis; community indifference curves; demand and international trade. Integration of demand and supply; offer analysis; general equilibrium; equilibrium in product and factor markets. Application of trade theory; terms of trade; supply and demand shifts; technological change; factor supplies and trade; factor intensities; transport costs, location. Trade with many goods and countries; Leontief paradox; Human skills; technological gaps; the product cycle; scale economics. Trade policy protection; tariff and non-tariff measures; trade and market structure; trade liberalisation; Factor mobility and movements; Role of multinational enterprises.

UNIT III: International finance; institutional money and credit markets; foreign exchange markets. Balance of payments analysis; funds flow; capital and current account. International adjustment mechanisms; fiscal and monetary adjustments.

UNITIV: The International Monetary System; Bretton Woods to WTO. Recent developments in the international trade system. Implications for developing countries. Trade Blocks.

Pratical

Determination of absolute and comparative advantage. Gains from trade with fixed exchange rates. Estimation of terms of trade. Derivation of offer curves and effects of technological change and factor supply. Estimation of protection coefficients. Measurement of effects of tariff imposition. Effects of tariff and non-tariff barriers on domestic supply and imports. Preparation of BOP accounts.

AG.STAT AND CA 501: STATISTICS AND COMPUTER APPLICATION

3(2+1)

Theory

Unit I: Agriculture statistics: Area, Production and Yield statistics; Agency and method of Collection of Area and yield statistics in U.P.; Crop Cutting experiment; Agriculture and Livestock Censuses; Sources of Official Agriculture statistics.

Unit II:. Planning and designing of experiments, Basic principles of Design of Experiments, uniformity trials, Fairfield Smithôs law, Shape and size of plots and blocks. Elements of linear estimation. Variance stabilizing transformations. Analysis of variance and covariance. Completely randomized, Randomized block and Latin square designs. Mutually orthogonal Lath squares

Unit III: Introduction to computer. A brief history of computing. Use, Definition, Anatomy, Components, Classification of Computers, Capabilities and limitation of a computer.

Unit IV: Introduction to MS-Office ï Word, Excel, Power Point, Fundamental of computer network ï LAN, MAN & WAN, Introduction of Internet, Email, surfing & browsing

Practical: Crop cutting methods, CRD, RBD and Latin square designs, Introduction of MS Paint, MS Note pad, Introduction of MS Word, Excel, Power Point, Introduction of internet, Browser, E-mail.