

B. SC. (HONS.) AGRICULTURE SYLLABUS 2019 BATCH ONWARDS
(UPDATED ON 20.08.2019)

Semester – First 2019

Course code	Course Title	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BAGRS 1-101	Fundamentals of Horticulture	1	0	40	60	100	1
BAGRS 1-103	Fundamentals of Plant Biochemistry and Biotechnology	2	0	40	60	100	2
BAGRS 1-105	Fundamentals of Soil Science	2	0	40	60	100	2
BAGRS 1-107	Introduction to Forestry	1	0	40	60	100	1
BAGRS 1-109	Comprehension & Communication Skills in English	1	0	40	60	100	1
BAGRS 1-111	Fundamentals of Agronomy	3	0	40	60	100	3
BAGRS 1-113	Introductory Biology*	1	0	20	30	50	1
BAGRS 1-115	Elementary Mathematics**	2	0	40	60	100	2
BAGRS 1-117	Agricultural Heritage	1	0	40	60	100	1
BAGRS 1-119	Rural Sociology & Educational Psychology	2	0	40	60	100	2
BAGRS 1-121	Human Values & Ethics	1	0	Satisfactory / Un Satisfactory			Non-Credit
BAGRS 1-102	Fundamentals of Horticulture (Practical)	0	2	20	30	50	1
BAGRS 1-104	Fundamentals of Plant Biochemistry and Biotechnology (Practical)	0	2	20	30	50	1
BAGRS 1-106	Fundamentals of Soil Science (Practical)	0	2	20	30	50	1
BAGRS 1-108	Introduction to Forestry (Practical)	0	2	20	30	50	1
BAGRS 1-110	Comprehension & Communication Skills in English (Practical)	0	2	20	30	50	1
BAGRS 1-112	Fundamentals of Agronomy (Practical)	0	2	20	30	50	1
BAGRS 1-114	Introductory Biology (Practical)	0	2	20	30	50	1
BAGRS 1-116	NSS/NCC/Physical Education & Yoga Practices#	0	2	Satisfactory / Un Satisfactory			Non-Credit
Total		*15/ **16	*16 ** /14	480	720	1200	21

*Remedial course for students who had studied non-medical in 10+2

** Remedial course for students who had studied medical in 10+2

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Semester - Second 2019

Course code	Course Title	Load Allocation		Marks Distribution		Total	Credits
		L	P	Internal	External		
BAGRS 1-201	Fundamentals of Genetics	2	0	40	60	100	2
BAGRS 1-203	Agricultural Microbiology	1	0	40	60	100	1
BAGRS 1-205	Soil and Water Conservation Engineering	1	0	40	60	100	1
BAGRS 1-207	Fundamentals of Crop Physiology	1	0	40	60	100	1
BAGRS 1-209	Fundamentals of Agricultural Economics	2	0	40	60	100	2
BAGRS 1-211	Fundamentals of Plant Pathology	3	0	40	60	100	3
BAGRS 1-213	Fundamentals of Entomology	3	0	40	60	100	3
BAGRS 1-215	Fundamentals of Agricultural Extension Education	2	0	40	60	100	2
BAGRS 1-217	Communication Skills and Personality Development	1	0	40	60	100	1
BAGRS 1-202	Fundamentals of Genetics (Practical)	0	2	20	30	50	1
BAGRS 1-204	Agricultural Microbiology (Practical)	0	2	20	30	50	1
BAGRS 1-206	Soil and Water Conservation Engineering (Practical)	0	2	20	30	50	1
BAGRS 1-208	Fundamentals of Crop Physiology (Practical)	0	2	20	30	50	1
BAGRS 1-210	Fundamentals of Plant Pathology (Practical)	0	2	20	30	50	1
BAGRS 1-212	Fundamentals of Entomology (Practical)	0	2	20	30	50	1
BAGRS 1-214	Fundamentals of Agricultural Extension Education (Practical)	0	2	20	30	50	1
BAGRS 1-216	Communication Skills and Personality Development (Practical)	0	2	20	30	50	1
Total		16	16	520	780	1300	24

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BAGRS 1-101 FUNDAMENTALS OF HORTICULTURE 2 (1+1)

Unit-1

Horticulture-Its definition and branches, importance and scope. Horticultural and botanical classification; climate and soil for horticultural crops. Principles of orchard establishment

Unit-2

Plant propagation-methods and propagating structures; Seed dormancy, Seed germination. Principles and methods of training and pruning.

Unit-3

Pollination, pollinizers and pollinators; Juvenility and flower bud differentiation, unfruitfulness. fertilization and parthenocarpy.

Unit-4

Importance of plant bio-regulators in horticulture. Irrigation – methods, Fertilizer application in horticultural crops. Medicinal and aromatic plants.

Reference Books

1. Adams, C.R. and M. P. Early. 2004. Principles of horticulture. Butterworth –Heinemam, Oxford University Press.
2. Bansil. P.C. 2008. Horticulture in India. CBS Publishers and Distributors, New Delhi. Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagercoil.
3. Bhattacharjee.S.K. 2006. Amenity Horticulture, Biotechnology and Post harvest technology. Pointer publishers. Jaipur
4. Chadha, K.L. 2001, Handbook of Horticulture, ICAR, New Delhi.
5. Chandra, R. and M. Mishra. 2003. Micropropagation of horticultural crops. International Book Distributing Co., Lucknow.
6. Chattopadhyaya, P.K.2001. A text book on Pomology (Fundamentals of fruit growing) Kalyani Publication, New Delhi
7. Christopher, E.P. 2001. Introductory Horticulture, Biotech Books, New Delhi
8. Edmond, J.B. T.L.Senn, F.S. Andrews and P.G.Halfacre, 1975. Fundamentals of Horticulture, Tata MC. Graw Hill Publishing Co.New Delhi
9. George Acquaaah, 2002, Horticulture-principles and practices. Prentice-Half of India pvt. Ltd., New Delhi.
10. Hartman, H.T. and Kester, D.E. 1986. Plant propagation – Principles and Practices – Prentice Hall of India Ltd., New Delhi.
11. Azhar Ali Farooqui and Sreeramu, B.S. 2001. Cultivation of medicinal and aromatic plants. United Press Limited.
12. Atal, E.K. and Kapur, B. 1982. Cultivation and Utilization of Medicinal and Aromatic plants. CSIR, New Delhi.
13. Jain, S.K. 1968. Medicinal Plants .National Book Trust New Delhi. Oxford & IBH, New Delhi.
14. Dastur, J.F. 1982. Medicinal plants of India Pakistan Taraprevalasoms and co-private Ltd, Bombay.

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BAGRS 1-103 FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY 3
(2+1)

Unit-1

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Poly saccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitter ions nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes.

Unit-2

Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA:Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

Unit-3

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications. Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance.

Unit-4

Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant. DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

Reference Books

1. Berg, J.M., Tymoczko, J.C. and Stryer, L. (2002). Biochemistry. W.H. Freeman & Co., New York.
2. Conn, E.C., Stumpf, P.K., Bruening, G and Doi, R.H. (2005). Outlines of Biochemistry. John Wiley & Sons (Asia) Pvt. Ltd., Singapore
3. Jain, J.L. (2000) Fundamentals of Biochemistry Chand & Co., New Delhi.
4. Moran, L.A., Horton, R.A., Scrimgeour, G. and Perry, M. (2012). Principles of Biochemistry 5th edition, Pearson Prentice Hall.
5. Nelson, D.L. and Cox, M.M. (2006) Lehingers Principles of Biochemistry. W.H. Freeman & Co., New York.
6. Powar, C.B. and Chatwal, G.R. (1986). Biochemistry. Himalaya Publishing House, New Delhi.
7. Rao, K.R. (1986). Text book of biochemistry.
8. Brown T A. 2002. *Genomes 2*. 2nd ed. New york:Wiley-Liss.

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9. Prave P, Faust U, Sittig W & Sukatsch DA. 1987. *Basic Biotechnology: A Student's Guide*. VCH Verlagsgesellschaft.
10. Renneberg R. 2008. *Biotechnology for Beginners*. Academic Press Publishers.
11. Singh, B. D. Plant Biotechnology
12. Chawla H.S. Introduction to Plant Biotechnology, Oxford & IBH, New Delhi.

BAGRS 1-105 FUNDAMENTALS OF SOIL SCIENCE 3 (2+1)

Unit-1

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity.

Unit-2

Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability. Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability.

Unit-3

Soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation. Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties.

Unit-4

Soil organisms: macro and micro organisms, their beneficial and harmful effects. Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Reference Book:

1. A text book of Soil Science – T.D. Biswas & S.K. Mukherjee Tata McGraw-Hill Publishing Company.
2. Conception, Application of Pedology – J.L. Sehgal.
3. Fundamentals of Soil Science – Indian Society of Soil Science.
4. Fundamentals of Soil Science Wiley Eastern PVT LTD New Delhi, Roth HD and Turk L H.
5. Introduction to soil Physics – D. Hillel.
6. Manures and Fertilizer, Agri/ KA Publishing Co Nagpur, Yawalkar, KS Aggarwal, JP and Bakele S.
7. Soil Physics – B.P. Ghildyal and R.P. Tripathy.
8. Soil theory chemistry and Fertility in tropical Asia, Prentice hall of PVT LTD, New Delhi India Tenhane R.V. Motiramani, DP, Bali VP and Dohhahue Royl.
9. The Nature and properties of Soil Mcmillan publishing Co. New Delhi, Brady, Nylkse CC :
10. The nature and properties of soils-N.C. Brady and Ray R. Weil, Pearson Publications

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BAGRS 1-107 INTRODUCTION TO FORESTRY (NEW) 2(1+1)

Unit-1

Introduction – definitions of basic terms related to forestry, forest classification, and types salient features of Indian Forest Policies Plant propagation-methods and propagating structures; Seed dormancy, Seed germination Natural and artificial methods of plant propagation. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers.

Unit-2

Silviculture, objectives of silviculture Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning

Unit-3

Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method. Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.

Unit-4

Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

Reference Books

1. Tejwani, K. G. Agroforestry In India
2. Bebarta, K. C. Forest Resources & Sustainable Development
3. Prabhu, S. Indian Forestry
4. Bebarta, K. C. Planning For Forest Resources And Bio Diversity Managment
5. KhanaLS . Forest Mensuration International Book Distributors Dehradun Uttarakhand
6. Khanna L S. Principles and Practice Of Silviculture”
7. Manikandan &Prabh . Indian Forestry: A breakthrough approach to Forest Service”

BAGRS 1-109 COMPREHENSION & COMMUNICATION SKILLS IN ENGLISH
2 (1+1)

Unit-1

War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English by G.B. Shaw.

Unit-2

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Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to help the students in the enrichment of vocabulary.

Unit-3

Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.

Unit-4

The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

BAGRS 1-111 FUNDAMENTALS OF AGRONOMY 4 (3+1)

Unit-1

Agronomy and its scope, tillage and tith, seeds and sowing, , crop density and geometry, crop rotation and its principles ,Crop nutrition, manures and fertilizers, nutrient use efficiency.

Unit-2

water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation-scheduling criteria and methods, quality of irrigation water, logging.

Unit-3

Weeds- importance, classification, crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy.

Unit-4

Growth and development of crops, factors affecting growth and development. Plant ideotypes, adaptation and distribution of crops. Crop management technologies in problematic areas, harvesting and threshing of crops.

References Books:

1. Cheema S.S., D.K. Dhaliwal and T.S. Sahota. Theory and Digest Agronomy.
2. Chhidda Singh. Modern techniques of raising field crops
3. Lenka, D. Climate, weather and crops in India
4. Mavi, H.S. Introduction to Agro-meteorology. Oxford and IBH Publishing Co., New Delhi.
5. Morachan, Y. B. Crop Production and Management. Oxford and IBH Publisher Co. Pvt. Ltd., New Delhi Reddy, S. R. Principles of Agronomy. Kalyani Publishers, New Delhi
6. Morachan, Y.B. Crop production and management. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
7. Rajendra Prasad. Field crops
8. Reddy, S.R. Principles of Agronomy. Kalyani Publishers, New Delhi.
9. Singh S.S. Principles and Practices of Agronomy. Kalyani Publishers, New Delhi.

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10. Singh, S. S. Crop Management under irrigated and rainfed condition. Kalyani Publishers, New Delhi
11. Vaidya, V.G., K.R. Sahasrabudde and V.S. Khuspe. Crop Production and Field Experimentation. Continental Prakashan, Pune.

BAGRS 1-113 INTRODUCTORY BIOLOGY (NEW) 2(1+1)*

Unit-1

Introduction to the living world, diversity and characteristics of life.

Unit-2

Origin of life, Evolution and Eugenics. Binomial nomenclature and classification Cell and cell division.

Unit-3

Morphology of flowering plants. Seed and seed germination.

Unit-4

Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

BAGRS 1-115 ELEMENTARY MATHEMATICS 2(2+0)

Unit-1

Straight lines: Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line.

Two-point form of equation of line, Intercept form of equation of line, Normal form of equation of line,

Unit-2

General form of equation of line, Point of intersection of two St. lines, Angles between two St. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral. Circle: Equation of circle whose center and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2) , Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.

Unit-3

Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x^n , e^x , $\sin x$ & $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y=f$ (Simple problems based on it).

Unit-4

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Integral Calculus: Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it). Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.

BAGRS 1-117 AGRICULTURAL HERITAGE (NEW COURSE) 1(1+0)*

Unit-1

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture.

Unit-2

Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge.

Unit-3

Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India.

Unit-4

Crop significance and classifications; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

BAGRS 1-119 RURAL SOCIOLOGY & EDUCATIONAL PSYCHOLOGY 2(2+0)*

Unit-1

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension,

Unit-2

Social Ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.

Unit-3

Educational psychology: Meaning & its importance in agriculture extension.

Unit-4

Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

BAGRS 1-121 HUMAN VALUE AND ETHICS 1(1+0)**

Unit-1

Values and Ethics-An Introduction. Goal and Mission of Life.

Unit-2

Vision of Life. Principles and Philosophy. Self-Exploration. Self-Awareness. Self-Satisfaction.

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Unit-3

Decision Making. Motivation. Sensitivity. Success. Selfless Service. Case Study of Ethical Lives.

Unit-4

Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.

BAGRS 1-102 FUNDAMENTALS OF HORTICULTURE (PRACTICAL)

Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation including micro-propagation. Layout and planting of orchard. Training and pruning of fruit trees. Preparation of potting mixture. Fertilizer application in different crops. Visits to commercial nurseries/orchard

BAGRS 1-104 FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY (PRACTICAL)

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action. Paper chromatography/ TLC demonstration for separation of aminoacids/ Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.

BAGRS 1-106 FUNDAMENTALS OF SOIL SCIENCE (PRACTICAL)

Study of soil profile in field, Study of soil sampling tools, collection of representative soil sample, its processing and storage, Study of soil forming rocks and minerals, Determination of soil density, moisture content and porosity, Determination of soil texture by feel and Bouyoucos Methods, Studies of capillary rise phenomenon of water in soil column and water movement in soil, Determination of soil pH and electrical conductivity, Determination of cation exchange capacity of soil, Study of soil map, Determination of soil colour, Demonstration of heat transfer in soil, Estimation of organic matter content of soil.

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BAGRS 1-108 INTRODUCTION TO FORESTRY (PRACTICAL)

Identification of tree-species. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees. Height measurement of standing trees by shadow method, single pole method and hypsometer. Volume measurement of logs using various formulae, age determination of trees, Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

BAGRS 1-110 COMPREHENSION AND COMMUNICATION SKILLS IN ENGLISH (PRACTICAL)

Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness & Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions and extempore.

BAGRS 1-112 FUNDAMENTALS OF AGRONOMY (PRACTICAL)

Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agro-climatic zones of India, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield attributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seeddrill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

BAGRS 1-114 INTRODUCTORY BIOLOGY (PRACTICAL)

Morphology of flowering plants – root, stem and leaf and their modifications. Inflorescence, flower and fruits. Cell, tissues & cell division. Internal structure of root, stem and leaf. Study of specimens and slides. Description of plants - Brassicaceae, Fabaceae and Poaceae.

BAGRS 1-116 NSS / NCC / PHYSICAL EDUCATION AND YOGA PRACTICES

Teaching of skills of Football/basketball/kabaddi/badminton/table tennis/yoga – demonstration, practice of the skills, correction, involvement in game situation, teaching of rules of the game (For girls teaching of Tennikoit) Teaching – Meaning, Scope and importance of Physical Education Teaching – Definition, Type of Tournaments Teaching – Physical Fitness and Health Education Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball)

2ND
SEMESTER

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BAGRS 1-201 FUNDAMENTALS OF GENETICS 3 (2+1)

Unit-1

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes. Chromosomal theory of inheritance - cell cycle and cell division- mitosis and meiosis.

Unit-2

Probability and Chi-square. Dominance relationships, Epistatic interactions with example. Multiple alleles, pleiotropism and pseudoalleles. Sex determination and sex linkage, sex limited and sex influenced traits. Blood group genetics. Linkage and its estimation, crossing over mechanisms. chromosome mapping. Structural and numerical variations in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics.

Unit-3

Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis Cytoplasmic inheritance, Genetic disorders.

Unit-4

Nature, structure & replication of genetic material. Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Reference Book:

1. Singh, B. D. Fundamentals of Genetics - Kalyani Publisher
2. Lewin, B. Genes - Jones and Bartlett Publishers.
3. Strickberger, M. W. Genetics - (McMillan, New York)
4. Gupta, P.K. Genetics. Rastogi Publications.
5. Gardner, E. J., Simmons, M. J. and Snustad, D. P. Principles of Genetics
6. Sinnott, E.W., Dunn, L.C. and Dobzhansky, T. Principles of Genetics

BAGRS 1-203 AGRICULTURAL MICROBIOLOGY 2 (1+1)

Unit-1

Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.

Unit-2

Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposon. Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles.

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Unit-3

Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.

Unit-4

Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Reference Books

1. M T Madigan, and J M Martinko, 2014. *Brock Biology of Microorganisms* 14th Edn. Pearson.
2. M J Pelczar, 1998. *Microbiology* 5th Edn. Tata Mc. Grow Hill Education Pvt. Ltd.
3. Stainer, R, 1995. *General Microbiology*. Palgrave Macmillan.
4. Edward Alchano, 2002. *Introduction to Microbiology*. Jones and Bartlett hearing.
5. R P Singh, 2007. *General Microbiology*. Kalyani Publishers.
6. J Heritage, E G V Evans, R A Killington, 2008. *Introductory Microbiology*. Cambridge University press P. date.
7. Pelczar, jr.M.J.E.C.S.Chan and Krieg, N.R. 1996. *Microbiology*. Mc Graw Hill Publishers, Newyork.
8. Prescott, L.M. Harley, J.P. and Klein, D.A (5ed) 2002. *Microbiology*. Mc Graw Hill Publishers, Newyork.
9. Madigan, M. Martinkoj, M. and Parker (10 ed.) 2003. *Biology of Microorganisms*. Prentice Hall of India Pvt. Ltd., New Delhi.
10. Davis, B.D. Dullbecco H.S. (1990) *Microbiology: 4th Ed.* Harper & Row, R. Elisena dn Ginsberg Publishers, Singapore.
11. Tortora, G.J. Funke, B.R. and case, C.L. (1994) *Microbiology : An introduction: 5th Ed.* The Benjamin/Cummings Publishing Company, Inc.
12. Purobit,S.S. (2000)*Microbiology: Fundamental and Applications (6th Ed).* Agrobios, (India).
13. Postagate, J. (2000) *Microbes & MAN 4TH Ed,* Cambridge Uni., Press.
14. Tortora G.J. Funke B.R. 2001 *Microbiology: An introduction* Benjamin Cummings.

BAGRS 1-205 SOIL AND WATER CONSERVATION ENGINEERING 2(1+1)

Unit-1

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion. Water erosion: Forms of water erosion. Gully classification and control measures.

Unit-2

Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping and Contour bund.

Unit-3

Contour bund. Graded bund and bench terracing. Grassed water ways and their design. Water harvesting and its techniques.

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Unit-4

Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

Reference Books

1. Baver, L.D. : Soil Physics (Ch. 8, 9 & 12 only), John Willey & Sons,
a. New Delhi
2. Iraelson : Irrigation Principles, John Willey & Sons, New Delhi
3. Gandhi R.T., Gupta P.C., Handbook of Irrigation – Water Management
a. Joseph A.P. and Rage N.I.
4. Dastane N.G., Singh M., Review of Work done on Water
5. Hukeri S.B. : Requirement of Crops in India
6. Mickael A.M. and Ojha T.P. : Principles of Agricultural Engg., Volume II
7. Mickael, A.M. : Irrigation: Theory and Practices
8. Paliwal, K.V. : Irrigation with Saline Water, IARI, New Delhi.
9. Reddie, T.Y. and Reddy G.H.S.: Efficient use of irrigation water

BAGRS 1-207 FUNDAMENTALS OF CROP PHYSIOLOGY

Unit-1

Introduction to crop physiology and its importance in Agriculture Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology.

Unit-2

Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms. Photosynthesis: Light and Dark reactions, C₃, C₄ and CAM plants; Respiration: Glycolysis, TCA cycle and electron transport chain

Unit-3

Fat Metabolism: Fatty acid synthesis and Breakdown. Plant growth regulators: Physiological roles and agricultural uses.

Unit-4

Physiological aspects of growth and development of major crops. Growth analysis, Role of Physiological growth parameters in crop productivity.

Books Recommended

1. Bhatia K.N & Tyagi M.P Elementary Biology.
2. Jain V.K Fundamentals of Plant Physiology.
3. Salisbury J.B and Ross L.W . Plant physiology. Wadswar Publisher Company.

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4. Srivastava H.N Plant Physiology.

5. Verma V Text Book of Plant Physiology.

BAGRS 1-209 FUNDAMENTALS OF AGRICULTURAL ECONOMICS (2+0)

Unit-1

Introduction: - Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country.

Unit-2

Theory of Demand: - Meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input output relationship.

Laws of returns & Supply: - Law of variable proportions and law of returns to scale. Cost: concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply.

Market structures & Distribution theories: - Meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.

Unit-3

Population & National Income: - Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socioeconomic determinants, current policies and programmes on population control.

Money & Banking: - Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy.

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Unit-4

Agricultural and public finance: - Meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation, VAT.

Economic systems: - Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

Reference Book:

1. Dutt, R & K.P.M Sunderam: Indian Economy
2. T.R Jain Macroeconomics
3. R.K Lekhi: Public Finance
4. Agricultural Economics Reddy and Raghuram Oxford and IBH
5. Dewett, K.K. : Modern Economics Theory, Premier Publishing Co. Delhi.
6. Jather & Berry : Elementary Principles of Economics.
7. Samuelson : Economics & Introductory Analysis, McGraw Hill Book Co., New York.
8. Sen, D.N. : Elementary Economics (Text Book), Calcutta.

BAGRS 1-211 FUNDAMENTALS OF PLANT PATHOLOGY 4 (3+1)

Unit-1

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens.

Unit-2

Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes. Types of parasitism and variability in plant pathogens.

Unit-3

Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes. *Bacteria and mollicutes:* general morphological characters. Basic methods of classification

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and reproduction. *Viruses*: nature, structure, replication and transmission. Study of phanerogamic parasites.

Unit-4

Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (*Heterodera*, *Meloidogyne*, *Anguina*, *Radopholus* etc.)

Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants. Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Reference Books

1. *Plant Pathology* by G.N Agrios 5th edition; Academic Press.
2. *Plant Pathology* by B.P. Pandey; S Chand & Co.
3. *Plant pathology* by R.P Singh, 2nd Edition 2012 (Reprinted-2016); Kalyani Publishers.
4. *Plant diseases* by R.S Singh, 8th Edition; oxford & IBH PUBLISHING CO. PVT. LTD
5. *Introductory Mycology* (English, Paperback, Blackwell C. J. Alexopoulos C. W. Mims M.); 4th Edition; Wiley india Pvt. Ltd.
6. *Microbiology* by R.P Singh 3RD Edition; Kalyani Publishers.
7. *Plant pathology* by R.S Mehrotra, 2nd Edition; McGRAW HILL Education (INDIA) Private Limited.
8. *Dasgupta MK. Principles of plant pathology. Allied Publishers; 1988.*
9. Chopra GL. text book of fungi.

BAGRS 1-213 FUNDAMENTALS OF ENTOMOLOGY 4 (3+1)

Unit-1

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus.

Unit-2

Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

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Unit-3

Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors—temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – food competition, natural and environmental resistance. Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control importance, hazards and limitations. Recent methods of pest control, repellents, anti feed ants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions.

Unit-4

Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes. Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papilionidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthredinidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

Reference Books

1. Gullan PJ, Cranston PS. The insects: an outline of entomology. John Wiley & Sons; 2014 Nov 3.
2. Alford DV. A textbook of Agricultural Entomology. Blackwell Science Ltd; 1999.
3. Ross HH. A Text Book Of Entomology. John Wiley And Sons, Inc.,; New York; Chapman And Hall, Limited; London; 2013 Jul 2.
4. Richards OW. Imms' Outline Of Entomology. Springer Science & Business Media; 2012 Dec 6.
5. Davies RG, editor. Outlines of entomology. Springer Science & Business Media; 2012 Dec 6.
6. Nayar KK, Ananthakrishnan TN, David BV. General and applied entomology.
7. David BV. General and applied entomology. Tata McGraw-Hill Education; 2004.

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8. Chapman RF, Chapman RF. The insects: structure and function. Cambridge university press; 1998 Nov 12.
9. Pruthi HS. Textbook on agricultural entomology. Textbook on agricultural entomology.. 1969.
10. Mishra RC. Honeybees and their management in India. Indian Council of Agricultural Research Krishi Anusandhan Bhavan Pusa; New Delhi; 1995.
11. Atwal AS. Agricultural Pests of India and South-East Asia. Agricultural pests of India and South-East Asia.. 1976.
12. Metcalf CL, Flint WP. Destructive and useful insects. Their habits and control. Destructive and useful insects. Their habits and control.. 1962.
13. Snodgrass, R.E.Principles of Insect Morphology.CBS Publishers and Distributors, New Delhi, 2001
14. Pedigo LP, Rice ME. Entomology and pest management. Waveland Press; 2014 Dec 22.
15. Srivastava PD, Singh RP. An introduction to entomology. Concept Publishing Company; 1997.
16. Saxena SC. Biology of insects. Oxford & IBH; 1992.
17. Gatoria G S. Introductory Entomology Unistar Education

BAGRS 1-215 FUNDAMENTALS OF AGRICULTURAL EXTENSION EDUCATION 3(2+1)

Unit-1

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development.Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.) various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.).

Unit-2

New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India.

Unit-3

Community Dev.-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.

Unit-4

Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication.

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Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Reference Books

1. Jalihal, K.A. Veerabhadraiah, V. (2007), Fundamentals of Extension Education and Management in Extension, Concept Publishing Company.
2. Ray, G.L. (2003), Extension Communication and Management. Kalyani Publishers. Fifth revised and enlarged edition.
3. Dahama, O.P. and Bhatnagar, O.P. (2003). Education and Communication for Development. Oxford and IBH Publishing Co. Pvt. Ltd.
4. Sandhu, A.S. (1993) Textbook on Agricultural Communication: Process and Methods. Oxford and IBH Publishing Co. Pvt. Ltd.
5. Chitambar, J.B. (2008). Introductory Rural Sociology. New Age International (P) Limited.
6. Sachdeva, D. R. and Bhushan, V (2007). An Introduction to Sociology. KitabMahal Agency.
7. Reddy, A.A (2001), Extension Education, Bapatla: Sri Lakshmi Press.
8. Sehgal, S. and Raghuvanshi, R.S. (2007) Text Book of Community Nutrition. ICAR: New Delhi.

BAGRS 1-217 COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT 2 (1+1)

Unit-1

Communication Skills: Structural and functional grammar; meaning and process of communication,

Unit-2

Verbal and nonverbal communication; listening and note taking, Writing skills, oral presentation skills; Field diary and lab record; indexing, footnote and bibliographic procedures.

Unit-3

Reading and comprehension of general and technical articles,

Unit-4

precise writing, summarizing, abstracting; individual and group presentations, impromptu resentation, public speaking; Group discussion. Organizing seminars and conferences.

BAGRS 1-202 FUNDAMETALS OF GENETICS 3 (2+1)

Practical

Study of microscope. Study of cell structure. Mitosis and Meiosis cell division. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross. Experiments on probability and Chi-square test. Determination of linkage and cross-over analysis (through two point test cross and three point test cross data). Study on sex linked inheritance in Drosophila.

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BAGRS 1-204 AGRICULTURAL MICROBIOLOGY

Practical

Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture. Methods of sterilization. Nutritional media and their preparations. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial cultures. Isolation of Rhizobium from legume root nodule. Isolation of Azotobacter from soil. Isolation of Azospirillum from roots. Isolation of BGA. Staining and microscopic examination of microbes.

BAGRS 1-206 SOIL AND WATER CONSERVATION ENGINEERING

Practical

General status of soil conservation in India. Calculation of erosion index. Estimation of soil loss. Measurement of soil loss. Preparation of contour maps. Design of grassed water ways. Design of contour bunds. Design of graded bunds. Design of bench terracing system. Problem on wind erosion

BAGRS 1-208 FUNDAMENTALS OF CROP PHYSIOLOGY

Practical

Study of plant cells, structure and distribution of stomata. Demonstration of imbibition, osmosis, and plasmolysis. Measurement of root pressure. Measurement of rate of transpiration. Separation of photosynthetic pigments through paper chromatography. Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients Estimation of relative water content, Measurement of photosynthetic CO₂ assimilation by Infra Red Gas Analyser (IRGA).

BAGRS 1-210 FUNDAMENTALS OF PLANT PATHOLOGY

Practical

Acquaintance with various laboratory equipment's and microscopy. Collection and preservation of disease specimen Preparation of media, isolation and Koch's postulates. General study of different structures of fungi. Study of symptoms of various plant diseases Study of representative fungal genera. Staining and identification of plant pathogenic bacteria. Transmission of plant viruses. Study of phanerogamic plant parasites. Study of morphological features and identification of plant parasitic nematodes. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting. Study of fungicides and their formulations. Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations

BAGRS 1-212 FUNDAMENTALS OF ENTOMOLOGY

Practical

Methods of collection and preservation of insects including immature stages.

External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus. Types of insect larvae and pupae. Dissection of digestive system in insects (Grasshopper); Dissection of male and female reproductive systems in

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insects (Grasshopper). Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. Insecticides and their formulations. Pesticide appliances and their maintenance. Sampling techniques for estimation of insect population and damage.

BAGRS 1-214 FUNDAMENTALS OF AGRICULTURAL EXTENSION EDUCATION

Practical

To get acquainted with university extension system. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; Preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media. Visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

BAGRS 1-216 COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Practical

Listening and note taking, Writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; Individual and group presentations.