

BACHELOR OF SCIENCE (HONS.-AGRICULTURE) – FIRST SEMESTER

First Semester			
S. No.	Name of Subject	Credits	Total Marks
1	Fundamentals of Horticulture	2	100
2	Fundamentals of Plant Biochemistry and Biotechnology	3	100
3	Fundamentals of Soil Science	3	100
4	Introduction to Forestry	2	100
5	Comprehension & Communication Skills in English	2	100
6	Fundamentals of Agronomy	4	100
7	Any One 1. Elementary Mathematics 2. Introductory Biology	2	100
8	Agricultural Heritage	1	100
9	Rural Sociology & Educational Psychology	2	100
10	Human Values & Ethics	1	100
11	NSS/NCC/Physical Education & Yoga Practices	2	100
Total		24	

FUNDAMENTALS OF HORTICULTURE

Theory

Scope and importance and classification of horticultural crops and their culture and nutritive value, area and production, exports and imports, fruit and vegetable zones of India and of different states, nursery management practices, soil and climate, vegetable gardens, nutrition and kitchen garden and other types of gardens – principles, planning and layout, management of orchards, planting systems and planting densities. Production and practices for fruit, vegetable and floriculture crops, nursery techniques and their management. Principles and methods of pruning and training of fruit crops, types and use of growth regulators in horticulture, water management, weed management, fertility management in horticultural crops, cropping systems, intercropping, multi-tier cropping, mulching, bearing habits, factors influencing the fruitfulness and unfruitfulness. Rejuvenation of old orchards, top working, frames working, principles of organic farming.

Suggested list of practical

Tools and implements, Features of orchard, planning and layout of orchard, layout of nutrition garden, preparation of nursery beds for sowing of vegetable seeds, digging of pits for fruit

plants, planting systems, training and pruning of orchard trees, preparation of fertilizer mixtures and field application, preparation and application of growth regulators, bio enhancers layout of different irrigation systems, identification and management of nutritional disorder in fruits and vegetables, assessment of bearing habits, maturity standards, harvesting, grading, packaging and storage.

Suggested Reading:

1. Prasad and Kumar, 2014. *Principles of Horticulture* 2nd Edn. Agrobios (India).
2. Neeraj Pratap Singh, 2005. *Basic concepts of Fruit Science* 1st Edn. IBDC Publishers.
3. Gardner/Bardford/Hooker. J.R., 1957. *Fundamentals of Fruit Production*. Mac Graw Hill BookCo., New York.
4. Edmond,J.B, Sen,T.L, Andrews,F.S and Halfacre R.G., 1963. *Fundamentals of Horticulture*.Tata Mc Graw Hill Publishing Co., New Delhi.
5. Kumar, N., 1990. *Introduction to Horticulture*. Rajyalakshmi publications, Nagarcoil, Tamilnadu
6. Jitendra Singh, 2002. *Basic Horticulture*. Kalyani Publishers, Hyderabad.
7. Denisen E.L.,1957. *Principles of Horticulture*. Macmillan Publishing Co., New York.
8. Chadha,K.L.(ICAR),2002,2001. *HandbookofHorticulture* . ICAR, NewDelhi
9. K.V.Peter, 2009. *Basics Horticulture*. New India Publishing Agency
10. Kausal Kumar Misra and Rajesh Kumar, 2014. *Fundamentals of Horticulture*. Biotech Books.
11. D.K. Salunkhe and S.S. Kadam, 2013. *A handbook of Fruit Science and Technology*. CRC Press.
12. S. Prasad and U. Kumar, 2010. *A handbook of Fruit Production*. Agrobios (India).
13. Jitendra Singh, 2011. *Basic Horticulture*. Kalyani Publications, New Delhi.

FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY

Theory

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharide's, Mutarotation; Structure of Disaccharides and Poly saccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membranelipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions 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. 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. 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; 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.

Suggested list of 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 amino acids/ 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

Suggested Reading:

1. Lehninger, Nelson, D. L. and Michael, M. C. 2004. *Principles of Biochemistry*. Freeman Publishers
2. Narayanan L M. *Biochemistry*. Saras Publications
3. Bose. *Developments in Physiology Biochemistry & Molecular Biology of Plants Vol.-1*. New India Publications.
4. D and Voet J. G. 2004. *Biochemistry 4th Edn*. Wiley & sons Publishers. USA.
5. Sadashiv, S and Manickam, A. 1996. *Biochemical methods for Agricultural sciences*. New age Interantional publishers, New Delhi.
6. Voet, D. and Voet, J.G. 2004. (3rd edit). *Biochemistry*. John Wiley & sons Incl.USA.
7. Rameshwar, A. 2006. (3rd edit). *Practical Biochemistry*. Kalyani Publishers, New Delhi.
8. Buchanan, B. B., Grissem, W. and Jones, R. L. 2002. *Biochemistry and molecular biology of plants*. 2nd edition. Blackwell publications, UK.
9. Singh, B D, 2004. *Biotechnology Expanding Horizons 2nd Edn*. Kalyani Publishers, New Delhi.
10. Gupta, P.K., 2015. *Elements of Biotechnology 2nd Edn*. Rastogi and Co., Meerut.
11. Razdan M K, 2014. *Introduction to plant Tissue Culture 2nd Edn*. Science Publishers, inc. USA.
12. Gautam V K, 2005. *Agricultural Biotechnology*. Sublime Publications
13. Thomar, R.S., Parakhia, M.V., Patel, S.V. and Golakia, B.A., 2010. *Molecular markers and PlantBiotechnology*, New Publishers, New Delhi.
14. Purohit, S.S., 2004. *A Laboratory Manual of Plant Biotechnology 2nd Edn*. Agribios, India.
15. Singh, B.D. 2012. *Plant Biotechnology*. Kalyani publishers, Ludhiana
16. Bilgrami, K.S. and Pandey, A.K.1992. *Introduction to Biotechnology*. CBS Pub. New Delhi
17. Gupta, P.K. 1994. *Elements of Biotechnology*. Rastogi Pub. Meerut.
18. Chahal, G.S. and Gosal, S.S.2003. *Principles and Procedures of Plant Approaches Breeding Biotechnological and Conventional*. Narosa Publishing House, New Delhi

FUNDAMENTALS OF SOIL SCIENCE

Theory

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

Suggested list of 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.

Suggested Reading:

1. Brady Nyle C and Ray R Well, 2014. *Nature and properties of soils*. Pearson Education Inc., New Delhi.
2. Indian Society of Soil Science, 2002. *Fundamentals of Soil Science*. IARI, New Delhi.
3. Sehgal J. A., 2005. *Textbook of Pedology Concepts and Applications*. Kalyani Publishers, New Delhi.
4. Dilip Kumar Das, 2015. *Introductory Soil Science*. Kalyani Publishers, Ludhiana.
5. Biswas, T.D. and Mukharjee, S.K., 2015. *Text Book of Soil science*. Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
6. Brady, N.C., 1995. *The Nature and properties of Soils*. Macmillan Publishing Co, New York.
7. Ghildyal, B.P. and Tripathi, R.P., 1987. *Soil Physics*. Acad. Press. New York.
8. Kolay, A.K., 1983. *Basic concepts of Soil Science*. Wiley Eastern Ltd., New Delhi
9. Brady, N. C. and Weil, R. R., 2010. *Elements of the Nature and Properties of Soils* (3rd Edition), Pearson Education, New Delhi.
10. Foth, H.D., 1991. *Fundamentals of Soil Science* (8th Edition), John Wiley & Sons, New Delhi.
11. Das, D .K., 2011. *Introductory Soil Science* (3rd Edition), Kalyani publisher, Ludhiana (India).

INTRODUCTION TO FORESTRY

Theory

Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, and salient features of Indian Forest Policies. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; 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. 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.

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.

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. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

COMPREHENSION AND COMMUNICATION SKILLS IN ENGLISH

Theory

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 G.B. Shaw. Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations. 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. The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

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

FUNDAMENTALS OF AGRONOMY

Theory

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, logging.

Weeds- importance, classification, crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy. Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

Practical

Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agroclimatic zones of India, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing 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, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

ELEMENTARY MATHEMATICS

Theory

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, 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 centre 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 $x^2 + y^2 = a^2$. 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 $y=f(x)$ (Simple problems based on it).

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.

INTRODUCTORY BIOLOGY

Theory

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics. Binomial nomenclature and classification Cell and cell division. Morphology of flowering plants. Seed and seed germination. Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

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.

AGRICULTURAL HERITAGE

Theory

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; 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; Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY

Theory

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development. Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

Suggested reading

1. Chitambar, J.B. 1973. Introductory rural sociology. New York, John Wiley and Sons.
2. Desai, A.R. 1978. Rural sociology in India. Bombay, Popular Prakashan, 5th Rev. ed.
3. Doshi, S.L. 2007. Rural sociology. Rawat Publishers, Delhi.
4. Jayapalan, N. 2002. Rural sociology. Altanic Publishers, New Delhi.
5. Sharma, K.L. 1997. Rural society in India. Rawat Publishers, Delhi.
6. Bhatia, H.R. 1965. A Text Book of Educational Psychology, Asia Publishing House, New Delhi.
7. Pujari, D. 2002. Educational Psychology in Agriculture, Agrotech Publishing Academy, Udaipur (Raj.)
8. Bhushan, V. and Sachdeva, D.R. 2010. An introduction to Sociology, Kitab Mahal , New Delhi.

HUMAN VALUES & ETHICS

Theory

Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life. Principles and Philosophy. Self Exploration. Self Awareness. Self Satisfaction. Decision Making. Motivation. Sensitivity. Success. Selfless Service. Case Study of Ethical Lives. Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.

NSS/NCC/PHYSICAL EDUCATION & YOGA PRACTICES

Theory

Course aims at evoking social consciousness among students through various activities viz., working together, constructive and creative social work, to be skilful in executing democratic leadership, developing skill in programme development to be able for self employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

Following activities are to be taken up under the NSS course:

- Introduction and basic components of NSS: Orientation
- NSS programmes and activities
- Understanding youth
- Community mobilisation
- Social harmony and national integration
- Volunteerism and shramdan
- Citizenship, constitution and human rights
- Family and society
- Importance and role of youth leadership
- Life competencies
- Youth development programmes
- Health, hygiene and sanitation
- Youth health, lifestyle, HIV AIDS and first aid
- Youth and yoga
- Vocational skill development
- Issues related environment
- Disaster management
- Entrepreneurship development
- Formulation of production oriented project
- Documentation and data reporting
- Resource mobilization
- Additional life skills
- Activities directed by the Central and State Government

All the activities related to the National Service Scheme course is distributed under four different courses viz., National Service Scheme I, National Service Scheme II, National Service Scheme III and National Service Scheme IV each having one credit load. The entire four courses should be offered continuously for two years. A student enrolled in NSS course should put in at least 60 hours of social work in different activities in a semester other than five regular one day camp in a year and one special camp for duration of 7 days at any semester break period in the two year. Different activities will include orientation lectures and practical works. Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction.