

HORTICULTURE

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| HORT-111 | Fundamentals of Horticulture | 2(1+1) |
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Theory

Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops; Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; medicinal and aromatic plants; importance of plant bio-regulators in horticulture. Irrigation – methods, Fertilizer application in horticultural crops.

| S.N. | Name of Topic | Cr Hrs |
|------|--|----------|
| 1. | Horticulture - Its definition and branches, importance and scope | 1 |
| 2. | Horticultural and botanical classification | 1 |
| 3. | Climate and soil for horticultural crops | 1 |
| 4. | Nursery raising and its importance | 1 |
| 5. | Plant propagation-methods | 2 |
| 6. | Propagating structures | 1 |
| 7. | Seed dormancy and Seed germination | 1 |
| 8. | Principles of orchard establishment | 2 |
| 9. | Principles and Methods of training and pruning | 1 |
| 10. | Juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy | 1 |
| 11. | Medicinal and Aromatic plants- importance and scope | 2 |
| 12. | Importance of plant bio-regulators in horticulture | 1 |
| 13. | Irrigation – methods, Fertilizer application in horticultural crops | 1 |

Practical (Fundamentals of Horticulture):

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.

| S.N. | Name of Topic | Cr Hrs |
|------|---|----------|
| 1. | Identification of Horticultural crops | 1 |
| 2. | Identification of garden tools | 1 |
| 3. | Preparation of seed bed/nursery bed | 1 |
| 4. | Practice of sexual and asexual methods of propagation | 3 |
| 5. | Micro-propagation | 1 |
| 6. | Layout and planting of orchard | 2 |
| 7. | Training and pruning of fruit trees | 1 |

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| 8. | Preparation of potting mixture | 1 |
| 9. | Fertilizer application in different crops | 1 |
| 10. | Layout and components of a model nursery | 2 |
| 11. | Visits to commercial nurseries/orchard | 2 |

Reference Books (Fundamentals of Horticulture)::

| S. no. | Title of Book | Author | Publisher |
|--------|--|-------------------------------------|---|
| 1 | Handbook of Horticulture (2002) | Chadha, K.L. | ICAR, NewDelhi |
| 2 | A handbook of Fruit Science and Technology (2013) | D.K. Salunkhe and S.S. Kadam | CRC Press |
| 3 | Basic Horticulture (2011) | Jitendra Singh | Kalyani Publications, New Delhi |
| 4 | Basics Horticulture (2009) | K.V.Peter | New India Publishing Agency |
| 5 | Fundamentals of Horticulture 2014 | Kausal Kumar Misra and Rajesh Kumar | Biotech Books |
| 6 | Introduction to Horticulture (1990) | Kumar, N. | Rajyalakshmi publications, Nagarcoil, Tamilnadu |
| 7 | Basic concepts of Fruit Science (2005) | Neeraj Pratap Singh | IBDC Publishers |
| 8 | Principles of Horticulture 2 nd Edn. 2014 | Prasad and Kumar | Agrobios (India) |
| 9 | A handbook of Fruit Production (2010) | S. Prasad and U. Kumar | Agrobios (India) |
| 10 | Precision farming | Singh Jitender | NIPA |
| 11 | Advances in Horticulture Biotechnology Vol.-7: Diagnostics for Horticulture crops | Singh, H.P. | Westville |
| 12 | Advances in horticulture Biotechnology, Vol-1: Fruit Crops | Singh, H.P. | Westville |
| 13 | Ethnobotany: A recent approach | Kapoor, B. | Madhu |
| 14 | Plant Growth Regulators in Agriculture & Horticulture: Their Role and commercial use | Basra, A.S. | IBD |
| 15 | Precision Farming in Horticulture: Approaches and Strategies | Swain, S. | NPH |
| 16 | Biometrical methods in Horticultural Sciences | Sharma, N. | NIPA |

BIOCHEMISTRY

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|--------------------|---|---------------|
| BIOCHEM-111 | Fundamentals of Plant Biochemistry and Biotechnology | 3(2+1) |
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Theory

Importance of Biochemistry; Properties of Water, pH and Buffer.

Carbohydrate: Importance and Classification, Reducing and Nonreducing sugars, Structures and properties of Monosaccharides, Disaccharides and Polysaccharides.

Lipid: Importance and classification, Structures and properties of fatty acids including membrane lipids.

Proteins: Importance and classification, Structures, titration and zwitter ion nature of amino acids, Structural organization of proteins.

Enzymes: General properties, Classification, Mechanism of action, Allosteric enzymes.

Nucleic acids: Importance and classification, Structure of Nucleotides, Secondary and Tertiary structures.

Metabolism of carbohydrates including Glycolysis, TCA cycle and Electron Transport Chain. Metabolism of lipids: Beta oxidation and Biosynthesis.

Plant Biotechnology: Concepts, Scope and applications. Scope and applications of organ cultures, embryo, cell suspension, callus, anther, pollen and ovule culture.

Micro-propagation methods: Organogenesis, Embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance, Somatic hybridization and cybrids.

Somaclonal variation and its use in crop improvement and Cryo-preservation.

Introduction to recombinant DNA methods: Physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods.

Transgenics: PCR techniques and its applications including Molecular Markers in crop improvement and Biotechnology regulations.

Practical

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids.

Quantitative estimation of glucose/ proteins. Estimation of amino acids/lipids, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides.

Sterilization techniques. Demonstration of isolation of DNA and gel electrophoresis techniques

Lecture Schedule – Theory

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| 1. Importance of Biochemistry; Properties of Water, pH and Buffer. | 1 |
| 2. Carbohydrate: Importance and Classification, Reducing and Non reducing sugars. | 1 |
| 3. Structures and properties of Monosaccharides, Disaccharides and Polysaccharides. | 2 |
| 4. Lipid: Importance and classification. | 1 |
| 5. Structures and properties of fatty acids including membrane lipids. | 2 |
| 6. Proteins: Importance and classification, Structures. | 2 |
| 7. Titration and zwitter ion nature of amino acids. | 1 |
| 8. Structural organization of proteins. | 1 |
| 9. Enzymes: General properties, Classification. | 1 |

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| 10. Mechanism of action, Allosteric enzymes. | 1 |
| 11. Nucleic acids: Importance and classification, Structure of Nucleotides. | 1 |
| 12. Secondary and Tertiary structures of nucleic acids. | 1 |
| 13. Metabolism of carbohydrates including Glycolysis. | 1 |
| 14. TCA cycle and Electron Transport Chain. | 2 |
| 15. Metabolism of lipids: Beta oxidation and Biosynthesis. | 2 |
| 16. Plant Biotechnology: Concepts, Scope and applications. | 1 |
| 17. Scope and applications of organ cultures, embryo, cell suspension, callus, anther, pollen and ovule culture. | 3 |
| 18. Micro-propagation methods: Organogenesis, Embryogenesis, Synthetic seeds and their significance. | 3 |
| 19. Embryo rescue and its significance. | 1 |
| 20. Somatic hybridization and cybrids. | 2 |
| 21. Somaclonal variation and its use in crop improvement and Cryo-preservation. | |
| 22. Introduction to recombinant DNA methods: Physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods. | 3 |
| 23. Transgenics: PCR techniques and its applications. | 1 |
| 24. Molecular Markers in crop improvement and Biotechnology regulations. | 2 |

SOIL SCIENCE & AGRIL. CHEMISTRY

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|-----------------|-------------------------------------|---------------|
| SSAC-111 | Fundamentals of Soil Science | 3(2+1) |
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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; soil taxonomical 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;

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. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Determination of soil colour.

Lecture Schedule – Theory

| S. No | Topic | No. of lecture |
|-------|--|----------------|
| 1. | Soil as a natural body, Pedological and edaphological concepts of soil | 1 |
| 2. | Soil genesis: soil forming rocks and minerals classification | 2 |
| 3. | Weathering of rocks - Chemical, Physical and Biological | 2 |
| 4. | Factors of soil formation, fundamental and specific soil forming processes | 2 |
| 5. | Soil Profile | 1 |
| 6. | Definition and components of soil | 1 |
| 7. | Soil Physical properties- Soil texture, classifications of soil separates, importance of soil texture, particle size analysis. Stoke's law | 2 |
| 8. | Soil structure and types of soil structure, mechanism of soil structure formation, management of soil structure. | 2 |
| 9. | Bulk density, particle density and porosity, factors affecting them, agricultural significance and manipulation | 1 |
| 10. | soil consistence and plasticity and their agricultural significance | 1 |
| 11. | Soil colour and expression of soil colour with munsell soil colour chart | 1 |
| 12. | soil taxonomical classification and soils of India | 2 |
| 13. | Soil water classification, forces of soil water retention | 2 |
| 14. | Movement of soil water and availability to plants | 1 |
| 15. | Soil air, composition, gaseous exchange and its composition, importance and in plant growth | 2 |
| 16. | Soil temperature; source, amount and flow of heat in soil; effect on plant growth, | 2 |
| 17. | Soil reaction-pH, soil acidity and alkalinity, buffering | 1 |
| 18. | effect of pH on nutrient availability | 1 |

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| 19. | Soil colloids, types of soil colloids and their significance | 2 |
| 20. | 1:1, 2:1 and 2:1:1 types of layer silicates, their structure and characteristics, sources of charges on soil colloids. | 2 |
| 21. | Cation and anion exchange phenomenon and factors influencing ion exchange, Base saturation | 1 |

Lecture Schedule Practical

| S. No | Topic | No. of lecture |
|-------|---|----------------|
| 1. | Study of Soil Profile in field | 1 |
| 2. | Study of soil sampling tools, Collection of representative sample, its processing and storage | 2 |
| 3. | Study of soil forming rocks and minerals | 2 |
| 4. | Determination of bulk density of undisturbed soil by core sampler method. | 1 |
| 5. | Determination of bulk density of disturbed soil by R D bottle methods | 1 |
| 6. | Determination of particle density of soil by R D bottle and computation of porosity of soil | 1 |
| 7. | Determination of lower and upper plastic limit of soil | 1 |
| 8. | Determination of field capacity, permanent wilting point of soil and WHC | 2 |
| 9. | Determination of soil texture by feel and Bouyoucos Methods. | 1 |
| 10. | Determination of soil pH and electrical conductivity | 1 |
| 11. | Determination of cation exchange capacity of soil | 2 |
| 12. | Determination of soil colour by munsell colour chart | 1 |

References:-

1. Boul S.W., Hole R.D., McCracken and Southard R.J. (1998). Soil genesis and classification Fourth Ed Panima Publishing corporation, New delhi.
2. .Baver, L.D. Gardener, W.H. and gardener W.R.(1976) Soil Physics Wiley Eastern Ltd, New Delhi
3. Biswas, T.D. and Mukherjee, S.K. (2006) Text book of soil science. Tata McGraw Hill publishing Co. Ltd, New Delhi
4. Brady, N.C. and Weil, R.R. (2002) The nature and properties of soils, prentice hall of India Pvt. Ltd, M-97, Connaught Circus, New Delhi
5. Das, D.K. (2002) Introductory Soil Science, Kalyani publisher, New Delhi
6. Mehra R.K. (2004) Text book of Soil Science, ICAR, New Delhi
7. ISSS (2009) Fundamentals of Soil Science, Div. of Soil Science, IARI, New Delhi
8. Chopra S.L. and Kanwar, J.S. (1991) Analytical Agricultural Chemistry, Kalyani publisher, Ludhiana
9. Jackson, M.L. (1973) Soil chemical analysis, Prentice Hall of India, Pvt. Ltd New Delhi
10. Piper, C.S. (1950) Soil and plant analysis. .Hans publications, Bombay
11. Richards, L.A. (1960) Diagnosis and improvement of saline and alkali soils., USDA agriculture Hand book 60, Washington D.C., USA

12. Gupta, I.C. & Sharma, S.K. (1988) Crop production in salt affected soils, Oxford and IBH Publication, New Delhi.
13. Agarwal, R.R., Yadav, J.S.P. & Gupta, R.N. (1982) Saline and alkali soils of India. ICAR, New Delhi.
14. Sehgal, J. (2000) Pedology: Concepts and applications, Kalyani publisher, Ludhiana

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|-----------------|---------------------------------|---------------|
| HORT-112 | Introduction to Forestry | 2(1+1) |
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Theory

Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, 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.

| S.N. | Name of Topic | Cr Hrs |
|-------------|---|---------------|
| 1 | Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies. | 2 |
| 2 | Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; | 2 |
| 3 | Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. | 2 |
| 4 | Crown classification. | 1 |
| 5 | Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning. | 2 |
| 6 | 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. | 3 |
| 7 | Agroforestry – definitions, importance, | 1 |
| 8 | Criteria of selection of trees in agroforestry, | 1 |
| 9 | Different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. | 1 |
| 10 | Cultivation practices of two important fast growing tree species of the region. | 1 |

Practical (Introduction to Forestry):

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.

| S.N. | Name of Topic | Cr Hrs |
|-------------|---------------------------------|---------------|
| 1 | Identification of tree-species. | 1 |

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|----------|---|----------|
| 2 | Diameter measurements using calipers and tape, | 2 |
| 3 | diameter measurements of forked, buttressed, fluted and leaning trees. | 2 |
| 4 | Height measurement of standing trees by shadow method, single pole method and hypsometer. | 2 |
| 5 | Volume measurement of logs using various formulae. | 2 |
| 6 | Nursery lay out, seed sowing, vegetative propagation techniques. | 4 |
| 7 | Forest plantations and their management. | 2 |
| 8 | Visits of nearby forest based industries. | 1 |

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|---------|---|--------|
| ENG-111 | Comprehension & Communication Skills in English (Gradiual course) | 2(1+1) |
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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: test in initiative, team spirit, leadership, intellectual ability. Group Discussions.

Theory:

| S. No. | Topics | No. of Lectures |
|--------|---|-----------------|
| 1. | War Minus Shooting- The sporting Spirit. | 1 |
| 2. | A Dilemma – A layman looks at science Raymond B. Fosdick. | 1 |
| 3. | You and Your English– Spoken English and broken English G.B. Shaw. Reading Comprehension, | 1 |
| 4. | Vocabulary-Antonym, Synonym, | 1 |
| 5. | Homophones, Homonyms, often confused words | 1 |
| 6. | Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations. | 1 |
| 7. | Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement | 1 |
| 8. | Transformation, Synthesis, | 1 |
| 9. | Direct and Indirect Narration. | 1 |
| 10. | Written Skills: Paragraph writing, | 1 |
| 11. | Precise writing, Report writing and Proposal writing. | 1 |
| 12. | The Style: Importance of professional writing. | 1 |
| 13. | Preparation of Curriculum Vitae and Job applications. | 1 |
| 14. | Synopsis Writing. | 1 |
| 15. | Interviews: kinds | 1 |
| 16. | Importance and process. | 1 |

Practical:

| S. N. | Topics | No. of Lectures |
|-------|--------|-----------------|
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| 1. | Listening Comprehension : Listening to short talks lectures | 1 |
| 2. | speeches (scientific, commercial and general in nature). | 1 |
| 3. | Oral Communication: Phonetics, | 1 |
| 4. | stress and intonation, | 1 |
| 5. | Conversation practice. | 1 |
| 6. | Conversation : rate of speech, clarity of voice, | 1 |
| 7. | Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement | 1 |
| 8. | speaking and Listening, politeness | 1 |
| 9. | Reading skills: reading dialogues, | 1 |
| 10. | rapid reading, | 1 |
| 11. | intensive reading, | 1 |
| 12. | improving reading skills.. | 1 |
| 13. | Mock Interviews: test inginitiative, | 1 |
| 14. | team spirit | 1 |
| 15. | leadership, intellectual ability. | 1 |
| 16. | Group Discussions | 1 |

AGRONOMY

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| AGRON-111 | Fundamentals of Agronomy | 4(3+1) |
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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, 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, Effect of sowing depth on germination and seedling vigour, 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.

Lecture schedule : Theory

| S.No. | Topic | No. of lectures |
|-------|---|-----------------|
| 1. | Agriculture-definition and importance of agriculture | 1 |
| 2. | Agronomy-meaning and scope of Agronomy | 1 |
| 3. | Types of seeds, dormancy of seeds | 1 |
| 4. | Viability of seeds, seed treatment | 1 |
| 5. | Sowing-methods, depth, plant density | 1 |
| 6. | Nursery bed and transplanting | 1 |
| 7. | Crop density and geometry | 1 |
| 8. | Optimum plant population | 1 |
| 9. | Tillage-definition and types of tillage including minimum and no tillage. | 1 |
| 10. | Tilth-definition and characteristics of good tilth. | 1 |
| 11. | Crop nutrition-essential nutrients-classification | 1 |
| 12. | Nutrient mobility in plants, Factors affecting nutrient availability | 1 |
| 13. | Functions and deficiency symptoms of primary nutrients | 1 |
| 14. | Manures –types, nutrient content , | 1 |
| 15. | Green manures, compost | 1 |
| 16. | Fertilizers , INM | 1 |
| 17. | Nutrient use efficiency | 1 |
| 18. | Irrigation : definition and objectives | 1 |

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| 19. | Water resources and irrigation development in India and Rajasthan. | 1 |
| 20. | Soil moisture constants and theories of soil water availability | 1 |
| 21. | Crop water requirement and factors affecting it | 1 |
| 22. | Scheduling of irrigation : meaning and different approaches for scheduling irrigation in field crops. | 1 |
| 23. | Surface methods of irrigation ; border , furrow , check basin and basin methods | 1 |
| 24. | Sprinkler and drip methods; their layout, adaptability , advantages and limitations. | 1 |
| 25. | Irrigation efficiency ; different terms used and their importance. | 1 |
| 26. | Water use efficiency -factors affecting and agronomic techniques to boost WUE | 1 |
| 27. | Irrigation water quality- different criteria and limits used, effect of poor quality water on plant growth . | 1 |
| 28. | Management practices for efficient use of poor quality waters including conjunctive use of water. | 1 |
| 29. | Agricultural drainage- definition, benefits and different methods of drainage. | 1 |
| 30. | Growth and development of crops, | 1 |
| 31. | factors affecting growth and development, | 1 |
| 32. | Plant ideotypes, | 1 |
| 33. | Crop rotation and its principles, | 1 |
| 34. | Adaptation and distribution of crops.. | 1 |
| 35. | Crop management technologies in problematic areas, | 1 |
| 36. | Harvesting and threshing of crops | 1 |
| 37. | Weeds – definition , harmful and beneficial effects and classification | 1 |
| 38. | Ecology of weeds | 1 |
| 39. | Weed - reproduction and seed dissemination | 1 |
| 40. | Crop-weed competition-concept and allelopathy | 1 |
| 41. | Concepts of weed prevention, eradication and weed control | 1 |
| 42. | Physical and cultural methods of weed control | 1 |
| 43. | Chemical and biological methods of weed control | 1 |
| 44. | Integrated weed management - An introduction | 1 |
| 45. | Introduction to herbicides, advantages and limitations of herbicides usages | 1 |
| 46. | Classification of herbicides | 1 |
| 47. | Herbicidal selectivity and resistance | 1 |
| 48. | Allelopathy | 1 |

Lecturer schedule: Practical

| S.No. | Topic | No. of lectures |
|-------|---|-----------------|
| 1 | Identification of crops, seeds, fertilizers, | 1 |
| 2 | Common Pesticides in agriculture | 1 |
| 3 | Study of agro-climatic zones of India and Rajasthan | 1 |

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| 4 | Identification of weeds in crops | 1 |
| 5 | Methods of herbicide and fertilizer application, | 1 |
| 6 | Study of yield contributing characters and yield estimation, | 1 |
| 7 | Seed germination and viability test | 1 |
| 8 | Numerical exercises on fertilizer requirement of crops | 1 |
| 9 | Plant geometry and plant population of various crops | 1 |
| 10 | Herbicides requirement calculations and water requirement | 1 |
| 11 | Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill, | 1 |
| 12 | Study of soil moisture measuring devices | 1 |
| 13 | Measurement of field capacity | 1 |
| 14 | Determination of bulk density | 1 |
| 15 | Determination of infiltration rate | 1 |
| 16 | Measurement of irrigation water | 1 |

References:

1. ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.
2. Panda, S.C. 2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
3. Balasubramanian, P. and Palaniappan, S.P.2016. Principles and Practices of Agronomy (2nd edition), Agrobios (India), Jodhpur
4. Reddy, T.Yellamanda and Reddy, G.H. Sankara. 2016. Principles of Agronomy (2nd edition) , Kalyani Publishers, Ludhiana
5. Reddy, S.R.2012. Principles of Crop Production (4th edition), Kalyani Publishers, Ludhiana.
6. Gupta , O.P. 2005. Weed Management: Principles and Practices (2nd Ed) Agribios (India) Jodhpur.
7. De, Gopal Chandra 1989, Fundamentals of Agronomy. Oxford & IBH Publishing Co., New-Delhi.
8. Michael, A.M. 1987. Irrigation - Theory and Practice, Vikas Publishing House Pvt. Ltd., New-Delhi.
9. Mishra, R.D. and Ahmed, M. 1987. Manual on Irrigation Agronomy, Oxford & IBH Publishing Co.Pvt..Ltd., New-Delhi.ngs
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| IB-111 | Introductory Biology (New) | 2(1+1) |
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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.

Elementary Mathematics

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| MATHS-111 | Elementary Mathematics | 2(2+0) |
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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. 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.

| S. N. | Topics | No. of Lectures |
|-------|--|-----------------|
| 1. | Functions, Evaluation of Functions, Operations with functions | 2 |
| 2. | Limits, continuity, $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$ | 2 |
| 3. | Limits $\lim_{x \rightarrow 0} \frac{\sin x}{x}, \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$ | 2 |
| 4. | Problems on continuity | 1 |
| 5. | Differentiation of $x^n, e^x, \sin x$ & $\cos x$ from first principle | 2 |
| 6. | differentiation of sum and product of functions | 1 |
| 7. | Quotient Rule, function of functions | 2 |
| 8. | Differentiation of function of functions, Parametric Equation | 1 |
| 9. | Logarithmic differentiation | 1 |
| 10. | Differentiation of Inverse Trigonometric functions | 1 |
| 11. | Successive differentiation, Maxima and minima | 2 |
| 12. | Integration Formulae | 1 |
| 13. | Integration by Substitution | 2 |

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| 14. | Integration by Parts | 2 |
| 15. | Definite Integration | 1 |
| 16. | Area under curves | 2 |
| 17. | Matrices, Matrix Addition, equality of matrices, square matrix, identity, null matrix | 2 |
| 18. | Subtraction, Scalar Multiplication, Matrix Multiplication, Transpose of a Matrix | 2 |
| 19. | Determinants | 1 |
| 20. | Inverse up to 3rd order | 2 |

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| AGHR-111 | Agricultural Heritage (New Course) | 1(1+0)* |
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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.

| S.No. | Topic | No. of lectures |
|--------------|--|------------------------|
| 1. | Introduction of Indian agricultural heritage | 1 |
| 2. | Ancient agricultural practices, | 1 |
| 3. | Relevance of heritage to present day agriculture | 1 |
| 4. | Past and present status of agriculture and farmers in society | 2 |
| 5. | Journey of Indian agriculture and its development from past to modern era; | 1 |
| 6. | Plant production and protection through indigenous traditional knowledge; | 2 |
| 7. | Crop voyage in India and world; | 1 |
| 8. | Agriculture -scope; Importance of agriculture and agricultural resources available in India; | 1 |
| 9. | Crop significance and classifications; | 1 |
| 10. | Classification of crops-botanical, agronomic, seasonal. | 1 |
| 11. | Classification of crops based on life span, special purposes i.e. cover, green manure, catch, trap, cash, soiling. | 1 |
| 12. | National agriculture setup in India; | 1 |
| 13. | Current scenario of Indian agriculture; | 1 |
| 14. | Indian agricultural concerns and future prospects. | 1 |

References:

1. ICAR 1989 Handbook of Agriculture, Indian Council of Agricultural Research, New-Delhi
2. Nene, Y.L. 2007. Glimpses of the Agricultural Heritage of India. Asian Agri- Histroy Foundation, Secunderabad, Andhra Pradesh.
3. Nene, Y.L., Saxena, R.C. and Choudhary, S.L. 2009. A Textbook on Ancient History of Indian Agriculture, Munshiram Manoharial Publishers Pvt. Ltd,
4. Nene, Y.L., Choudhary, S.L. and Saxena, R.C. 2010. Textbook on Ancient History of Indian Agriculture, Asian Agri-History Foundation.
5. D. Kumari, Manimuthu Veeral. 2014. Text Book on Agricultural Heritage of India. Agrotech Publishing Academy.
6. ICAR. Introductory Agriculture. ICAR e-course. Indian Council of Agricultural Research, New Delhi. (<http://www.agrimoon.com/wp-content/uploads/Introductory-Agriculture.pdf>)

EXTENSION EDUCATION

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| EXCOM-111 | Rural Sociology & Educational Psychology | 2 (2+0) |
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Theory:

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology: Definition, objectives, history, challenges and social ecology in Indian context, Rural society: Important characteristics, differences & Relationship between Rural and Urban societies., Social Groups: Meaning, Definition, Classification, Factors considered in formation and organization of groups. Social Stratification – Meaning, Definition, Functions, Forms of Social stratification. Culture concept - Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions - Meaning, Definition and their role in Agricultural Extension. Social Institution: Meaning, Definition, Major institutions in Rural society, Functions., Social Change & Development: Meaning, Definition, Nature of Social change and factors of social change. Social process- Meaning, Definition, types. Social Control- - Meaning, Definition, Need and Means of Social control.. Rural Leadership: concept and definition, types and roles of leaders in rural context; Methods of selection of leaders.

Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Cognitive skills, Personality- Meaning, Definition, Types, Factors influencing the Personality and Role of Personality in Agricultural Extension., Motivation; Meaning , Definition, Importance in extension, Theories of Motivation, Intelligence-Meaning, Definition, Types, Factors affecting intelligence..Teaching Learning Process process- Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics. Perception, Emotions.

Lecture Schedule

| S.No. | Course Content | No. of Lectures |
|--------------|---|------------------------|
| | Theory | |
| 1. | Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, | 1 |
| 2. | Social Ecology: Definition, objectives, history, challenges and social ecology in Indian context, | 1 |
| 3. | Rural society: Important characteristics, differences & Relationship between Rural and Urban societies., | 1 |
| 4. | Social Groups: Meaning, Definition, Classification, Factors considered in formation and organization of groups. | 2 |
| 5. | Social Stratification – Meaning, Definition, Functions, Forms of Social stratification. | 2 |
| 6. | Culture concept - Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions - Meaning, Definition and their role in Agricultural Extension. | 2 |
| 7. | Social Institution: Meaning, Definition, Major institutions in Rural society, Functions., | 2 |
| 8. | Social Change & Development: Meaning, Definition, Nature of Social change and factors of social change. | 2 |
| 9. | Social process- Meaning, Definition, types. | 2 |
| 10. | Social Control- - Meaning, Definition, Need and Means of Social control.. | 2 |
| 11. | Rural Leadership: concept and definition, types and roles of leaders in rural context; Methods of selection of leaders. | 2 |

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| 12. | Educational psychology: Meaning & its importance in agriculture extension. | 1 |
| 13. | Behavior: Cognitive, affective, psychomotor domain, Cognitive skills, | 2 |
| 14. | Personality- Meaning, Definition, Types, Factors influencing the Personality and Role of Personality in Agricultural Extension. | 2 |
| 15. | Motivation; Meaning , Definition, Importance in extension, Theories of Motivation, | 2 |
| 16. | Intelligence-Meaning, Definition, Types, Factors affecting intelligence. | 2 |
| 17. | Teaching Learning Process - Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics., | 3 |
| 18. | Perception, Emotions | 1 |

Suggested readings

1. Chidambaram, 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
8. Bhushan, V. and Sachdeva, D.R. 2010. An introduction to Sociology, Kitab Mahal , New Delhi.
9. Rao, C.N.S. 2015. Sociology, S.Chand & Company, New Delhi.
10. Maslow, A.H (1970) Motivation and personality. Harper and Row publishers , New York.

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| HVE-111 | Human Value and Ethics 1(1+0) | 1 (1+0) |
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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

Lecture Schedule:

| S. No. | Course Content | No. of Lectures |
|---------------|--|------------------------|
| | Theory | |
| 1. | Values and Ethics-An Introduction. Goal and Mission of Life. | 2 |
| 2. | Vision of Life& Principles | 1 |
| 3. | Self Exploration. Self Awareness. Self Satisfaction | 2 |
| 4. | Decision Making | 1 |
| 5. | Motivation. | 1 |
| 6. | Sensitivity. Success. Selfless Service. | 2 |
| 7. | Case Study of Ethical Lives. | 2 |
| 8. | Positive Spirit. Body, Mind and Soul | 2 |
| 9. | Attachment and Detachment | 1 |
| 10. | Spirituality Quotient | 1 |
| 11. | Examination | 1 |

II. NON-GRADIAL COURSES

1. NSS/NCC/Physical Education & Yoga Practices2(0+2)

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.

SYLLABUS

Semester I

Course Title: National Service Scheme I

Introduction and basic components of NSS:

Orientation: history, objectives, principles, symbol, badge; regular programmes under NSS, organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health

NSS programmes and activities

Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analysing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary

Understanding youth

Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change

Community mobilisation

Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilisation involving youth-adult partnership

Social harmony and national integration

Indian history and culture, role of youth in nation building, conflict resolution and peace-building

Volunteerism and shramdan

Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism

Citizenship, constitution and human rights

Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information

Family and society

Concept of family, community (PRIs and other community based organisations) and society

Semester I:National Cadet Corps

1. Aims, objectives, organization of NCC and NCC song. DG's cardinals of discipline.
2. Drill- aim, general words of command, attention, stands at ease, stand easy and turning.
3. Sizing, numbering, forming in three ranks, open and close order march and dressing.

4. Saluting at the halt, getting on parade, dismissing and falling out.
5. Marching, length of pace, and time of marching in quick/slow time and halt. Side pace, pace forward and to the rear.
6. Turning on the march and wheeling. Saluting on the march.
7. Marking time, forward march and halt.
8. Changing step, formation of squad and squad drill.
9. Command and control, organization, badges of rank, honours and awards
10. Nation Building- cultural heritage, religions, traditions and customs of India. National integration.
11. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizen.
12. Leadership traits, types of leadership. Character/personality development.
13. Civil defense organization, types of emergencies, fire fighting, protection,
14. Maintenance of essential services, disaster management, aid during development projects. 15. Basics of social service, weaker sections of society and their needs, NGO's and their contribution, contribution of youth towards social welfare and family planning.
16. Structure and function of human body, diet and exercise, hygiene and sanitation.
17. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health.
18. Adventure activities
19. Basic principles of ecology, environmental conservation, pollution and its control.
20. Precaution and general behaviour of girl cadets, prevention of untoward incidents, vulnerable parts of the body, self defense.

Physical Education and Yoga Practices Credit hours: 2(0+2) (0+2)

Semester I:Physical Education and Yoga Practices

1. Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
2. Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
3. Teaching of advance skills of Football – involvement of all the skills in game situation with teaching of rules of the game

4. Teaching of skills of Basketball – demonstration, practice of the skills, correction of skills, involvement in game situation
5. Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation
6. Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game
7. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
8. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
9. Teaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game
10. Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation
11. Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game
12. Teaching of some of Asanas – demonstration, practice, correction and practice
13. Teaching of some more of Asanas – demonstration, practice, correction and practice
14. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
15. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
16. Teaching of skills of Table Tennis – involvement of all the skills in game situation with teaching of rule of the game
17. Teaching – Meaning, Scope and importance of Physical Education
18. Teaching – Definition, Type of Tournaments
19. Teaching – Physical Fitness and Health Education
20. Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).