Annexure III

REVISED

DISCIPLINE WISE DETAILS OF COURSE CONTENT

FOR

POLYTECHNIC IN AGRICULTURE

OF

SAU's OF GUJARAT

2018

Detail Syllabus of Agriculture Polytechnic (Diploma in Agriculture)

FIRST SEMESTER

Sr. No.	Subject Code and Title of Course
1	**Agron.1.1 Agricultural Heritage** **Credit hours: (1+0=1)** **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.
2	**Agron.1.2 Fundamentals of Agronomy** **Credit hours: 4(3+1)** **Theory** Agronomy and its scope, seeds and sowing, tillage, land configuration and sub soiling, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency. Growth and development of crops. Agro-climatic zones of India and Gujarat. Classification of field crops and Factors affecting on crop production. Drought – definition – types of drought – effect of drought on crops – management of drought. Cropping systems – monocropping – definition and principles of crop rotation – mixed cropping – intercropping – relay cropping – multistoried cropping – sole cropping. Soil fertility and soil productivity – fertility losses – maintenance of soil fertility – soil organic matter Irrigation – Introduction, Importance, Definition and Objectives. Physical classification and Biological classification of water. Irrigation efficiency and water use efficiency, conjunctive use of water, Approaches for scheduling of irrigation; Methods of irrigation including micro irrigation system. Quality of irrigation water, water logging. Soil moisture constant: MWHC, ME, FC, PWP, Hygroscopic co-efficient. Weeds: definition, classification and characteristics. **Practicals** 1. Identification of crops, seeds, fertilizers, pesticides and tillage implements 2. Lay out and types of seed bed preparation 3. Practice of different methods of sowing 4. Study of yield contributing characters and yield estimation of major crops 5. Seed germination and viability test 6. Numerical exercises on plant population and seed rate 7. Use of tillage implements-reversible plough, one way plough, harrow and leveler 8. Study of sowing implements/equipment 9. Measurement of field capacity, bulk density and infiltration rate 10. Field layout of various irrigation methods 11. To work out the labour unit and unit of work for various field operations

3	**Hort. 1.1 Fundamentals of Horticulture Credit hours: 2(1+1)** **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; principles of orchard establishment; Principles and methods of training and pruning, bahar treatment**,** juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; kitchen gardening; garden types and parts; lawn making; use of plant bio-regulators in horticulture. Irrigation & fertilizers application-method and quantity **Practicals** 1. Identification of garden tools 2. Identification of horticultural crops 3. Preparation of seed bed/nursery bed 4. Practice of sexual and asexual methods of propagation 5. Layout and planting of orchard plants 6. Training and pruning of fruit trees 7. Transplanting and care of vegetable seedlings 8. Making of herbaceous and shrubbery borders 9. Preparation of potting mixture, potting and repotting 10. Fertilizer application in different crops 11. Visits to commercial nurseries/orchard
4	**GPB 1.1 Introductory Biology Credit hours: 2(1+1)** **Theory** Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics. Introduction and characteristics of plant, Binomial nomenclature and classification Cell and cell division. Morphology and Micro-morphology of flowing plants. Seed and seed germination. Introduction to plant taxonomy and plant systematic. Role of animals in agriculture. **Practicals** 1. Morphology of flowering plants – root, stem and leaf and their modifications 2. Study of Inflorence, flower and fruits 3. Study of Cell, tissues & cell division 4. Study of Internal structure of root, stem and leaf 5. Study of specimens and slides 6. Description of plants - Malvaceae, Fabaceae, Cucurbitaceae, Brassicaceae, Euphorbiaceae, Apiaceae, Solanaceae, Asteraceae, Poaceae and Liliaceae.

5	**Ag.Ento. 1.1 Fundamentals of Entomology** **Credit hours: 3(2+1)** **Theory** **Part – I:** History of Entomology in India. Factors for insect's abundance. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda up to classes. **Part – II:** Morphology: Structure and functions of insect cuticle, moulting and body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing. Metamorphosis in insects. Types of larvae and pupae. **Part – III:** Structure of male and female genital organs. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive systems in insects. Types of reproduction in insects. Major sensory organs. **Part – IV:** Classification of class Insecta upto Orders with Major characteristics of orders. **Part V: Beneficial Insects:** Honeybee, silkworm and lac insect **Practicals** 1. Methods of collection and preservation of insects including immature stages; 2. External features of Grasshopper/Cockroach; 3. Types of insect antennae, mouthparts and legs; types of wings. 4. Metamorphosis and diapause, 5. Types of insect larvae and pupae; 6. Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.
6	**Pl. Path. 1.1 Fundamentals of Plant Pathology** **Credit hours: 3 (2+1)** **Theory** 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. Causes and factors affecting disease development: Disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms (different groups): fungi, bacteria, phytoplasma, spiroplasma, viruses, viroids, algae, protozoa and phanerogamic plant parasites with example of diseases caused by them. Diseases and symptoms due to abiotic causes. Pathogenesis, Role of enzymes, toxins and growth regulators in disease development. Defence mechanism in plants. Epidemiology: Factors affecting disease development. 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 and reproduction. Viruses: Nature, architecture, multiplication and transmission. Growth and reproduction of plant pathogens. Liberation, dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens.

	Practicals 1. Acquaintance with various laboratory equipments and microscopy 2. Preparation of media, isolation and Koch's postulates 3. General study of different structures of fungi 4. Study of symptoms of various plant diseases 5. Study of representative fungal genera 6. Staining and identification of plant pathogenic bacteria 7. Transmission of plant viruses 8. Study of phanerogamic plant parasites 9. Study of fungicides and their formulations 10. Methods of pesticide application and their safe use 11. Calculation of fungicide sprays concentrations
7	**Ag.Econ. 1.1 Fundamentals of Agricultural Economics Credit hours: 2(2+0)** **Theory** *Economics:* 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.*Demand:* meaning, law of demand, 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*: Law of variable proportions and law of returns to scale. *Cost:* Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. *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 socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. *Economic systems:* Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning. Forms of business organizations, international trade and balance of payments.GST and its implication on Indian economy.

8	**Eng. 1.1 Comprehension and Communication Skills in English** **Credit hours: 2(1+1)** **Theory** Selected Short Stories of eminent writers from India and abroad: Rabindranath Tagore, Mulk Raj Anand, Premchand, R K Narayan, Isaac Asimov (Science Fiction), Sudha Murthy, Leo Tolstoy, O Henry, Anton Chekhov, Guy De Maupassant, K A Abbas Basic Grammar: Articles, Prepositions, Concord, Transformation, Synthesis, Reported Speech, Active- Passive Voice **Practicals** Reading Comprehension Practice in reading short paragraphs, notices, announcements, advertisements, newspaper articles, reports, etc. Writing Skills: Writing experimental reports and journals, Writing informal letters, leave applications, Writing short notices, announcements, Filling simple forms for different purposes, Short Notes Listening Comprehension: Listening to announcements at public places like Railway Station, Bus Station, Airports, Malls, etc., Listening to short conversations on basic language functions, Listening to short speeches and lectures, Listening to news on TV & Radio Speaking: Introduction, Greeting people on different occasions, Carrying out basic language functions like Asking for Permission, Asking and Showing directions, Describing people and places, Reporting ongoing events, etc.
9	**HVE 2.1 Human Value and Ethics (Non-gradial)* Credit hours: (1+0=1)** **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.
10	**PE 1.1 NSS/NCC/Physical Education & Yoga Practices Credit hours: (0+1)** **(Non-gradial)*** **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.
	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, 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
	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.

	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 g0ame 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).

SECOND SEMESTER

Sr. No.	Subject Code and Title of Course
1.	**Agron. 2.3 Farming System and Farm Management Credit hours: 2(1+1)** **Theory:** Farming System-scope, importance, concept and effects of modern agriculture. Characteristics and objective of farming system. Farming system components and their maintenance. Cropping system and pattern, multiple cropping system. Allied enterprises and their importance. Tools for determining production and efficiencies in cropping and farming system. HEIA and LEISA and its techniques for sustainability, Integrated farming system-historical background, objectives and characteristics, Components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones. Meaning and concept of farm management, objectives, Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. **Practicals** 1. Preparation of cropping scheme 2. Study of dominant cropping systems of the area 3. Preparation of integrated farming system model for irrigated land 4. Preparation of farm layout with various components 5. Preparation of farm budget 6. Estimation of yield of various field crops 7. Study of farm records and farm transaction **8.** Working out cost of cultivation **9.** Preparation of calendar of operations for cotton crop
2	**Ag. Chem. 2.1 Fundamentals of Soil Science Credit hours: 3(2+1)** **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- Methods of particle size analysis, 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; source, amount and flow of heat in soil; soil temperature and 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 micro organisms, their beneficial and harmful effects.

	Practicals 1. Study of soil sampling tools, collection of representative soil sample, its processing and storage 2. Study of soil profile in field. Study of soil forming rocks and minerals 3. Determination of particle density and bulk density of soil and computation of porosity 4. Determination of soil moisture content and maximum water holding capacity and computation of moisture constants 5. Determination of soil texture by feel and international pipette method 6. Studies of capillary rise phenomenon of water in soil column and water movement in soil 7. Study of soil map. Determination of soil colour 8. Demonstration of heat transfer in soil 9. Determination of soil pH and electrical conductivity 10. Determination of cation exchange capacity of soil 11. Estimation of organic matter content of soil
3	**Hort. 2.2 Production Technology for Fruit and Plantation Crops** **Credit hours: 2(1+1)** **Theory** Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, papaya, apple, pomegranate, Sapota, Custard apple minor fruits: jackfruit, strawberry, pineapple, Ber and Jamunplantation crops- major coconut, arecanut, cashew minor :, tea, coffee & rubber. **Practicals** 1. Description and identification of important varieties of fruit and plantation crops 2. Seed propagation 3. Scarification and stratification of seeds 4. Propagation methods for fruit and plantation crops including Micro-propagation 5. Description and identification of fruit 6. Preparation of plant bio regulators and their uses, and physiological disorders of above fruit and plantation crops 7. Visit to commercial orchard.
4	**Pl. Phy. 2.1 Fundamentals of Crop Physiology Credit hours: 3(2+1)** **Theory** Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants: Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants; Respiration: Glycolysis, Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity. Ascent of sap and antitranspirants. Photoperiodism, photorespiration and Vernalization. Translocation of solutes.

	Practicals 1. Study of plant cells and structure 2. To demonstrate that light and CO_2 is necessary for photosynthesis 3. To demonstrate that O_2 is produced during photosynthesis 4. Study of imbibitions, osmosis, plasmolysis 5. Rate of transpiration, photosynthesis, respiration 6. Study of different solutions
5	**Ag.Ento. 2.2 Principles of Integrated Pest Management Credit hours: 3(2+1)** **Theory** **Part I:** 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. Causes for outbreak of pests in agro-ecosystem **Part-II:**. Categories of insect pests, IPM: Introduction, history, importance, concepts, principles and tools of IPM [Host plant resistance, cultural, mechanical, physical, legislative, biological (parasites, predators & transgenic plant, pathogens such as bacteria, fungi and viruses) and chemical control (Importance, hazards and limitations)] Classification of insecticides, toxicity of insecticides and formulations of insecticides. Case histories of important IPM programmes. **Part III:** Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation, transgenic. Practices, scope and limitations of IPM. **Practicals** 1. Symptoms of poisoning, first aid and antidotes and Safety issues in pesticide uses 2. Methods of diagnosis and detection of various insect pests 3. Methods of insect pests sampling 4. Pest surveillance and pest forecasting 5. Assessment of crop yield losses 6. Application techniques of insecticides and appliances 7. Pesticide formulations and calculation of spray fluid and doses
6	**Maths 2.1 Elementary Mathematics Credit hours: 2(2+0)** **Theory** 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), 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, 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

7	**Pl. Path. 2.2 Introductory Plant Nematology Credit hours: 2 (1+1)** **Theory** Introduction, History of phytonematology. Economic importance. General characteristics of plant pathogenic nematodes. Nematode general morphology and biology. Classification of nematodes up to family level with emphasis on groups containing economically important genera. Classification of plant parasitic nematodes based on feeding habits. Identification of economically important plant nematodes up to generic level with the help of keys and description. Symptoms caused by nematodes with examples. Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses. Different methods of nematode management. Cultural methods (crop rotation, fallowing, soil amendments, other land management techniques), physical methods (soil solarization, hot water treatment). Biological methods, chemical methods (fumigants, non fumigants), Resistant varieties, IPM **Practicals** 1. Methods of survey- sampling methods, collection of soil and samples 2. Extraction of nematodes from soil and plant tissues following combined Cobb's sieving technique and Baermann funnel technique 3. Counting and estimation of plant parasitic nematodes 4. Preparation of temporary and permanent mounts 5. Method of preparation of perineal patterns for identification of species of *Meloidogyne* *6.* Study and identification of most important plant parasitic nematodes with special reference to their characteristics and symptomatology *7.* Experimental techniques used in pathogenicity studies with root-knot nematode *8.* Studies of Nematicides and their formulations *9.* Methods of Nematicides application and their safe use *10.* Calculation of Nematicides application concentrations.
8	**LPM 2.1 Principles of Livestock Production and management Credit hours: 3(2+1)** **Theory** Domestication and utility of farm animals and their role in Indian economy, History and Importance of co-operative movement of dairy sector in India. Animal husbandry methods in India, common terms pertaining to different species of livestock, Utility classification of breeds of Indian cattle. Familiarization with cattle, buffaloes, sheep and goat breeds of Gujarat. Common feeds and fodders, their classification and utility. Preservation and storage of fodder/forage as silage, Hay and haylage. Reproduction in farm animals (Ruminants), Housing principles, space requirements for different species of livestock (Ruminants), Management of calves, growing heifers, dry and pregnant animals and milch animals. Classification of feed stuffs. Prevention (including vaccination schedule) and control of important diseases of livestock.

	Practicals 1. Study of body parts and points of cattle, sheep, goat and their significance 2. Measuring and weighing of farm animals 3. Use of common restraints used in different animals 4. System of identification of livestock 5. Determination of age in farm animals 6. Identification of common feeds and fodders 7. Study of daily routine farm operations and farm records 8. Planning and layout of housing for different types of livestock 9. Clean milk production and milking methods
9	**PE 2.2 NSS/NCC/Physical Education & Yoga Practices Credit hours: 1(0+1) (Non-gradial)*** **National Service Scheme II** **Importance and role of youth leadership** Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership **Life competencies** Definition and importance of life competencies, problem-solving and decision-making, inter personal communication **Youth development programmes** Development of youth programmesand policy at the national level, state level and voluntary sector; youth-focused and youth-led organstions **Health, hygiene and sanitation** Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health. **Youth health, lifestyle, HIV AIDS and first aid** Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid **Youth and yoga** History, philosophy, concept, myths and misconceptions about yoga; yoga traditions and its impacts, yoga as a tool for healthy lifestyle, preventive and curative method
	Semester II: National Cadet Corps 1. Arms Drill- Attention, stand at ease, stand easy. Getting on parade. Dismissing and falling out. Ground/take up arms, examine arms. 2. Shoulder from the order and vice-versa, present from the order and vice-versa. 3. Saluting at the shoulder at the halt and on the march. Short/long trail from the order and vice-versa. 4. Guard mounting, guard of honour, Platoon/Coy Drill. 5. Characteristics of rifle (.22/.303/SLR), ammunition, fire power, stripping, assembling, care, cleaning and sight setting. 6. Loading, cocking and unloading. The lying position and holding.

	7. Trigger control and firing a shot. Range Procedure and safety precautions. Aiming and alteration of sight. 8. Theory of groups and snap shooting. Firing at moving targets.Miniature range firing. 9. Characteristics of Carbine and LMG. 10. Introduction to map, scales and conventional signs. Topographical forms and technical terms. 11. The grid system. Relief, contours and gradients.Cardinal points and finding north.Types of bearings and use of service protractor. 12. Prismatic compass and its use. Setting a map, finding north and own position. Map to ground and ground to map. 13. Knots and lashings, Camouflage and concealment, Explosives and IEDs. 14. Field defenses obstacles, mines and mine lying. Bridging, watermanship 15. Field water supplies, tracks and their construction. 16. Nuclear, Chemical and Biological Warfare (NCBW) 17. Judging distance. Description of ground and indication of landmarks. 18. Recognition and description of target. Observation and concealment. Field signals. Section formations. 19. Fire control orders. Fire and movement.Movement with/without arms.Section battle drill. **20.** Types of communication, media, latest trends and developments.
	Semester II: Physical Education and Yoga Practices 1. Teaching of skills of Hockey – demonstration practice of the skills and correction. 2. Teaching of skills of Hockey – demonstration practice of the skills and correction. And involvement of skills in games situation 3. Teaching of advance skills of Hockey – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game 4. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction. 5. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of the skills in games situation 6. Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game 7. Teaching of different track events – demonstration practice of the skills and correction. 8. Teaching of different track events – demonstration practice of the skills and correction. 9. Teaching of different track events – demonstration practice of the skills and correction with competition among them. 10. Teaching of different field events – demonstration practice of the skills and correction. 11. Teaching of different field events – demonstration practice of the skills and correction. 12. Teaching of different field events – demonstration practice of the skills and correction. 13. Teaching of different field events – demonstration practice of the skills and

	correction with competition among them. 14. Teaching of different asanas – demonstration practice and correction. 15. Teaching of different asanas – demonstration practice and correction. 16. Teaching of different asanas – demonstration practice and correction. 17. Teaching of different asanas – demonstration practice and correction. 18. Teaching of weight training – demonstration practice and correction. 19. Teaching of circuit training – demonstration practice and correction. 20. Teaching of calisthenics – demonstration practice and correction. 21. Note: 1) Compulsory Uniform: Half pants, Tee Shirts, Shoes and socks all white (Girls will have white Tee Shirt and Track pants) 2) The games mentioned in the practical may be inter changed depending on the season and facilities

THIRD SEMESTER

Sr. No.	Subject Code and Title of Course
1	**Agron.3.4 Crop Production Technology-I (*Kharif* Crops) Credit hours: 3(2+1)** **Theory** Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. **Cereals:** Rice, Maize, Sorghum, Pearl millet, Vari (Little millet), Kodomillet and Finger millet, **Pulses:** Pigeonpea, Greengram, Blackgram and Cluster bean, **Oilseeds:** Groundnut, Castor, Sesame, Sunflower and Soybean; **Fiber crops:** Cotton and Jute; **Forage crops:** Sorghum, Cowpea and Napier hybrid and Fodder maize **Cash crop**: Bidi tobacco, **Green manure Crops:** Sunhemp and Dhaincha. **Spices**– Fennel. **Practicals** 1. Identification of crops and seed 2. Field lay-out of different method of rice nursery including /SRI 3. Seed treatment and sowing of major crops 4. Effect of seed size on germination and seedling vigour of kharif crops 5. Effect of sowing depth and methods on germination crops 6 To study various methods of fertilizer application. 7. Study of growth and yield contributing characters 8. Visit to the agronomic and forage experiments 9. Numerical exercises on fertilizer, seed requirement and plant population
2	**Agron.3.5 Practical Crop Production-I (*Kharif* Crops) Credit hours: 1(0+1)** **Practical** Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.
3	**Ag. Chem. 3.2 Manures, Fertilizers and Soil Fertility Management** **Credit hours: 3(2+1)** **Theory** Classification and importance of organic manures, properties and methods of preparation of bulky manures. Green/leaf manuring. Transformation reactions of organic manures in soil and importance of C:N ratio in rate of decomposition. Integrated nutrient management. Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano-fertilizers, Soil amendments, Fertilizer Storage, Fertilizer Control Order. History of soil fertility and plant nutrition. Criteria of essentiality. Role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and

	irrigated conditions. **Practicals** 1. Determination of moisture and organic matter content from manures samples 2. Estimation of N, P, K & S from manure sample 3. Determination of N from urea fertilizers 4. Determination of NH_4-N, NO_3-N from nitrogenous fertilizers 5. Determination of P from phosphatic fertilizer 6. Determination of K from potassic fertilizer 7. Determination of S from sulphur fertilizer 8. Estimation of available N, P, K, S and micro nutrient (Fe, Mn, Zn, Cu) from soil sample
4	**Hort. 3.3 Production Technology for Vegetable and Spices Credit hours: 3(2+1)** **Theory** Importance of vegetables & spices in human nutrition and national economy, brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing method, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of important vegetable and spices. **Major crops**: **Fruit vegetables** : Brinjal, Tomato, Chilli, Okra **Cucurbits** : Bottle gourd, , Water melon **Cole crops :** Cabbage and cauliflower **Tuber** : Potato **Spices :** Turmeric, Ginger, **Minor crops: Cucurbits** : Cucumber, Ridge gourd, bitter gourd, Pointed gourd, Musk melon **Legumes** : Cluster bean, Cowpea **Root vegetables :** Radish, Carrot, Beet root, elephant foot **Tuber** : Sweet potato **Leafy vegetables** : Palak and Amaranthus **Bulb crops** : Onion, Garlic **Practicals** 1. Identification of vegetables & spices crops and their seeds 2. Study of raising vegetable nursery 3. Study of planning and layout of kitchen garden 4. Planting technique of tuber crops 5. Fertilizers applications in vegetable crops 6. Vegetables & spices seed extraction 7. Harvesting & post harvest technologies 8. Visit to commercial vegetable growers field and vegetable research station
5	**GPB 3.2 Fundamentals of Genetics Credit hours: 3(2+1)** **Theory** Introduction to genetics; Cell division: mitosis and meiosis; Mendelian principles of heredity; Study of chromosome structure; Multiple alleles, pleiotropism and pseudoalleles and blood group genetics; Linkage and its estimation, crossing over mechanisms, chromosome mapping; Sex determination and sex linkage, sex limited and sex influenced traits; Qualitative and quantitative traits, polygenes and continuous variations, multiple factor hypothesis; Cytoplasmic inheritance; Mutation- classification, Methods of inducing mutation and ClB technique, mutagenic agents and induction of mutation; Structural and

	numerical changes in chromosome; Nature, structure and replication of genetic material; Protein synthesis-transcription and translational mechanism of genetic material; Gene concept- gene structure and functions; Gene regulation- Lac and Trp operons. **Practicals** 1. Study of Microscope 2. Study of cell structure and functions 3. Practice on mitotic and meiotic cell division 4. Experiments on monohybrid, dihybrid, trihybrid, back cross and test cross 5. Chi-square test 6. Epistatic interactions 7. Determination of linkage and cross over analysis (through two point test cross and three point test cross data)
6	**Ag.Ento 3.3 Pests of Field Crops and Stored Grains and their Management** **Credit hours: 3 (2+1)** **Theory** General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, identification, biology and bionomics, nature of damage, and management of insect and non-insect major pests of paddy, sorghum, maize, Pearl millet, ragi (*Eleucine coracana*), wheat, sugarcane, cotton, sunnhemp, pulses, groundnut, castor, safflower, sunflower, mustard, soybean**,** tobacco etc. Common phytophagous mites, rodents, snail, slug, crab and bird pests. Stored grain pests: damage, and their management. **Practicals** 1. Identification of major pests, their damage symptoms and management of cereal crops (rice, pearl millet, sorghum, maize and wheat) 2. Identification of major pests, their damage symptoms and management of cash crops (sugarcane, tobacco and cotton) 3. Identification of major pests, their damage symptoms and management of major pulses 4. Identification of major pests, their damage symptoms and management of spices (cumin and fennel) 5. Identification of major pests, their damage symptoms and management of oil seeds (groundnut, sesame, sunflower, castor, mustard and soybean) 6. Identification of common phytophagous mites 7. Identification of rodents and bird pests 8. Identification of storage pests, nature of damage and management
7	**Pl. Path. 3.3 Diseases of Field and Horticultural Crops and Their Management-I** **Credit hours: 3 (2+1)** **Theory** Symptoms, etiology, disease cycle and management of major diseases of following crops: **Field Crops:** 1. Rice: blast, brown spot, bacterial blight, false smut, khaira and tungro 2. Maize: stalk rots, downy mildew, leaf spots; 3. Sorghum: smuts, grain mold and anthracnose, 4. Bajra :downy mildew, smut and ergot;

	5. Groundnut: early and late leaf spots, collar rot, stem and pod rot, bud necrosis 6. Sesamum: Phyllody, stem rot and leaf spot; 7. Soybean: Rhizoctonia blight and mosaic; 8. Pigeonpea: Phytophthora blight, wilt and sterility mosaic; 9. Black & green gram: Cercospora leaf spot and anthracnose, powdery mildew and yellow mosaic; 10. Castor: Wilt and root rot; 11. Tobacco: Damping off, frog eye, leaf curl and mosaic. **<u>Horticultural Crops:</u>** 12. Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; 13. Papaya: foot rot, leaf curl and mosaic, 14. Pomegranate: bacterial blight and leaf spot; 15. Brinjal: Phomopsis blight and fruit rot and little leaf; 16. Tomato: early and late blight and tomato spotted wilt; 17. Okra: Yellow Vein Mosaic and root knot nematode; 18. Beans: anthracnose and bacterial blight; 19. Coconut: wilt, stem bleeding 20. Cluster bean: powdery mildew, bacterial blight and bean common mosaic. **Practicals** 1. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory 2. Field visit for the diagnosis of field problems 3. Collection and preservation of plant diseased specimens for Herbarium **Note:** Students should submit 40 pressed and well-mounted specimens
8	**Ag.Engg. 3.1 Introductory Agricultural Engineering Credit hours: 2(1+1)** **Theory:** Biogas, site selection of biogas plant, types of biogas plants and its use. Renewable energy: biomass and its generation, application, gasification-components and types, Wind and solar energy, scope and application. Pumps, types of pumps and their utility. Concept of heat and mass transfer, Cleaning, grading, milling and storage of farm produce. Drying, grain drying, types of drying, types of dryers. Storage, grain storage, types of storage structures. Fruits and vegetables cleaning. Grading, methods of grading, equipment for grading of fruits and vegetables. Post harvest operations, process for cereal, pulse and oil seed crops. Equipment used in post harvest operations. **Practicals** 1. Study of different types of biogas plants 2. Study of different types of gasifiers 3. Study of cleaning and grading machineries 4. Calculation of pump power for irrigation 5. Visit of solar plant/ wind mills 6. Visit of processing industry
9	**PE 3.3 NSS/NCC/Physical Education & Yoga Practices Credit hours: 1(0+1)** **(Non gradial)***

FOURTH SEMESTER

Sr. No.	Subject Code and Title of Course
1	**Agron.4.6 Crop Production Technology-II (*Rabi* Crops) Credit hours: 3(2+1)** **Theory** Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; **Cereals:** Wheat, Barley and Amaranthus, **Pulses:** Chickpea and Peas, Lentil, Indian bean, **Oilseed:** Rapeseed, Mustard, Linseed and Safflower; **Sugar crops:** Sugarcane and Sugar beet; **Medicinal and Aromatic crops:** Mentha (mint), Lemon grass, Isabgul and Palmarosa **Forage crops:** Oat and Lucerne **Spice crops**: Coriander, Dill seed, Ajwain, Fenugreek and Cumin. **Commercial crop:** Chicory **Practicals** 1. Identification of crops and seed 2. Sowing methods of wheat and sugarcane 3. Seed treatment of different *rabi* crops 4. Effect of sowing depth and methods on germination crops 5 Study of growth and yield contributing characters 6. Visit to the agronomic and forage experiments 7. Numerical exercises on fertilizer, seed requirement, plant population and seed index 8. Judging the maturity and harvesting techniques
2	**Agron.4.7 Practical Crop Production-II (*Rabi* Crops) Credit hours: 1(0+1)** **Practicals** Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.
3	**Ag. Chem. 4.3 Problematic Soils and their Management Credit hours: 3(2+1)** **Theory** Soil quality and health, Distribution of Waste land and problem soils in Gujarat and India. Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils. Irrigation water – quality and standards, utilization of saline water in agriculture. Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-climatic zones of Gujarat.

	Practicals 1. Preparation of saturated paste of problematic soil 2. Determination of gypsum and lime requirement for reclamation of soil 3. Determination of EC and pH of water 4. Determination of CO_3 , HCO_3 and Cl from water 5. Determination of Ca, Mg and Na from water 6. Determination of EC and pH of soil 7. Determination of CO_3 , HCO_3 and Cl from soil 8. Determination of Ca, Mg and Na from soil 9. Irrigation water quality analysis: EC, carbonate, bicarbonate, chloride 10. Irrigation water quality analysis: Calcium, magnesium and sodium 11. Recommendation for quality of irrigation water
4	**Hort. 4.4 Production Technology of Flower Crops and Landscaping** **Credit hours : 2(1+1)** **Theory** Importance and scope of floriculture. Origin, area and production. Production technology of important flower crops – rose, jasmine, tuberose, chrysenthemum, merigold, golden rod, gerbera, gladiolus and gaillardia. Types of garden and their components. Principles of landscaping. Use of trees, shrubs, climbers, palm, house plants and seasonal flowers in garden. Bonsai techniques. **Practicals** 1. Identification of different flowering plants 2. Identification of different ornamental plants 3. Study of propagation methods of flower crops 4. Lay out of ornamental garden 5. Planning and layout of kitchen garden 6. Preparation of bouquet, garland and veni 7. Study of different flower arrangement 8. Visit to public and private gardens
5	**Ag. Ento. 4.4 Pests of Horticultural Crops and their Management** **Credit hours: 3 (2+1)** **Theory** Distribution, biology, nature and symptoms of damage, and management strategies of major insect and non-insect pests of vegetable crops (brinjal, okra, tomato, potato, chilies, onion and garlic) cruciferous and cucurbitaceous vegetables crops (cabbage, cauliflower, radish and guards crops), fruit trees (mango, sapota, citrus, banana, pomegranate, custard apple, aonla, ber, guava, papaya, coconut and date palm), Flowering plants (rose, marigold and gallardia). Plant protection in protected cultivation.

	Practicals 1. Identification and nature of damage of pests of solanaceous crops 2. Identification and nature of damage of pests of malvaceous crops 3. Identification and nature of damage of pests of cruciferous crops 4. Identification and nature of damage of pests of cucurbitaceous crops 5. Identification and nature of damage of pests of garlic, turmeric and ginger 6. Identification and nature of damage of pests of pulse vegetable 7. Identification and nature of damage of pests of leafy vegetables 8. Identification and nature of damage of pests of plantation crops (mango and sapota, banana, guava, pomegranate and custard apple; citrus, ber, papaya, moringa and aonla; coconut and date palm) 9. Identification and nature of damage of pests of rose, marigold and gallardia
6	**Pl. Path. 4.4: Diseases of Field and Horticultural Crops and Their Management-II** **Credit hours: 3 (2+1)** **Theory content:** Symptoms, etiology, disease cycle and management of following diseases: **<u>Field Crops</u>**: 1. Wheat: rusts, loose smut, karnal bunt, and ear cockle; 2. Sugarcane: red rot, smut, wilt, grassy shoot 3. Sunflower: Sclerotinia stem rot and Alternaria blight; 4. Mustard: Alternaria blight, white rust, downy mildew, powdery mildew 5. Gram: wilt, root rot and Ascochyta blight; 6. Cotton: anthracnose, vascular wilt, and black arm; 7. Pea: downy mildew, powdery mildew and rust. **<u>Horticultural Crops:</u>** 8. Mango: anthracnose, malformation, powdery mildew and red rust; 9. Citrus: canker and gummosis; 10. Grape vine: downy mildew, Powdery mildew and anthracnose; 11. Guava: wilt and anthracnose; 12. Ber: powdery mildew; 13. Sapota: leaf spot; 14. Potato: early and late blight, bacterial brown rot, scab, leaf roll; 15. Cucurbits: downy mildew, powdery mildew, wilt; 16. Onion and garlic: purple blotch, and Stemphylium blight; 17. Chillies: anthracnose and fruit rot, wilt and leaf curl; 18. Fenugreek: powdery mildew; 19. Cumin: Alternaria blight, powdery mildew and wilt; 20. Fennel: Ramularia blight, stem rot; 21. Coriander: stem gall and powdery mildew; 22. Cruciferous vegetables: Alternaria leaf spot and black rot; 23. Rose: dieback, powdery mildew and black leaf spot.

	Practicals 1. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory 2. Field visit for the diagnosis of field problems 3. Collection and preservation of plant diseased specimens for herbarium
7	**Ag. Stat. 4.1 Agricultural Informatics** **Credit hours: 3(2+1)** **Theory** 1. Introduction to Computers, 2. Anatomy of Computers, 3. Memory Concepts, Units of Memory, 4. Operating System, definition and types, 5. Applications of MS-Office for creating, Editing and Formatting a document, 6. Data presentation, tabulation and graph creation, statistical analysis, mathematical expressions, 7. Database, concepts and types, creating database, uses of DBMS in Agriculture, 8. Internet and World Wide Web (WWW), Concepts and components. 9. e-Agriculture, concepts, design and development. 10. Application of innovative ways to use information and communication technologies (IT) in Agriculture. 11. Computer Models in Agriculture: statistical, weather analysis and crop simulation models, concepts, structure, inputs-outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation. 12. IT application for computation of water and nutrient requirement of crops, 13. Computer-controlled devices (automated systems) for Agri-input management, 14. Smartphone mobile apps in Agriculture for farm advises, market price, postharvest management etc; 15. Geospatial technology, concepts, techniques, components and uses for generating valuable agri-information. 16. Decision support systems, concepts, components and applications in Agriculture, 17. Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. 18. Preparation of contingent crop-planning and crop calendars using IT tools. **Practicals** 1. Study of Computer Components, accessories, practice of important DOS Commands 2. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management 3. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document 4. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data, handling macros 5. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system 6. Introduction to World Wide Web (WWW) and its components. Hands on practice on Crop Simulation Models (CSM), DSSAT/Crop-Info/Crop Syst/ Wofost 7. Preparation of Inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools 8. Use of smart phones and other devices in agro-advisory and dissemination of market

	information 9. Introduction of Geospatial Technology, for generating information important for Agriculture 10. Hands on practice on preparation of Decision Support System. Preparation of contingent crop planning
8	**Ag.Engg. 4.2 Introductory Soil and Water Conservation Engineering** **Credit hours: 2(1+1)** **Theory** 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. **Types of water lifting devices. Different types of pumps and their use.** Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. water ways and their design. Water harvesting and its techniques. Wind erosion: types of soil movement. **Agroforestry interventions to control soil erosion.** Principles of wind erosion control and its control measures. Surveying: Field area calculation. Machineries required for land levelling **Practicals** 1. General status of soil conservation in India 2. Estimation of soil loss 3. Measurement of soil loss 4. Problem on wind erosion 5. Water lifting pump capacity, power calculation required 6. Vegetative measures to control soil erosion 7. Forestry measures to control soil erosion 8. Overview of physical management methods for control of soil erosion 9. Over view of water lifting devices 10. Centrifugal pump, importance and Hp calculation 11. Reciprocating pump, importance and use 12. Submersible pump use in agriculture
9	**Ag. Met. 4.1 Introductory Agro meteorology & Climate Change** **Credit hours: 2(1+1)** **Theory** Meaning and scope of agricultural meteorology; Earth atmosphere its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, cyclone, anticyclone, Land breeze and sea breeze; Atmospheric temperature, Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification: Monsoon-mechanism and importance in Indian agriculture, Weather hazards – drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold wave. Agriculture and weather relations Weather forecasting – types of weather forecast and their uses. Climate change, global warming, causes of climate change and its

	impact on regional and national Agriculture. **Practicals** 1. Measurement of Bright sunshine hours, total, shortwave and long wave radiation 2. Measurement of maximum, minimum air temperatures and soil temperature 3. Measurement of wind speed and wind direction, preparation of wind rose 4. Determination of vapor pressure and relative humidity 5. Measurement of rainfall 6. Analysis of rainfall data for climatological studies 7. Measurement of Pressure 8. Estimation of heat indices 9. Measurement of open pan evaporation 10. Computation of PET and AET
10	**PE 4.4 NSS/NCC/Physical Education & Yoga Practices** **Credit hours: 1(0+1) (Non gradial)***

FIFTH SEMESTER

Sr. No.	Subject Code and Title of Course
1	**Agron.5.8 Principles of Weed Management** **Credit hours: 2(1+1)** **Theory** Introduction, definition, losses, utilization, characteristics of weeds. Classification, reproduction and dissemination of weeds. Weed persistency and biology. Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management. **Practicals** 1. Weed identification and their losses study 2. Techniques of weed preservation 3. Herbicide label information and precautions in use of herbicides 4. Study of herbicide formulations and mixture of herbicide 5. Study of methods of herbicide application and spraying equipments 6. Calculations of herbicide doses, weed control efficiency and weed index 7. Weed control in non-cropped areas 8. Bio assay study for detection of herbicide residues in succeeding crops
2	**Agron.5.9 Principles of Water Management** **Credit hours: 3 (2+1)** **Theory** Irrigation–definition and objectives. Water management definition. Advantages and disadvantages of irrigation. Water resources and irrigation development in Gujarat. Form of soil moisture: Physical classification and Biological classification of water. Soil moisture constant: MWHC, ME, FC, PWP, Hygroscopic co-efficient. Approaches for scheduling irrigation: Methods of irrigation in detail – surface methods (only definition and examples), flooding, check basin method, Basin method, Border strip method, Furrow irrigation, Sprinkler and drip irrigation (definition, advantages and disadvantages).Quality of irrigation water: SAR, ESP, RSC; Salinity hazards, Sodium hazards. Salinity and Sodium management process. Water management of different crops (rice, wheat, maize, groundnut, sugarcane, mango, banana and tomato). Drainage, Water logging **Practicals** 1. Determination of PWP 2. Determination of soil moisture content by gravimetric method 3. Calculation of irrigation water requirement (Problems) 4. Different methods of irrigation **5.** Installation and maintenance of micro irrigation system

	6. Measurement of field capacity, bulk density and infiltration rate **7.** Estimation of saturated hydraulic conductivity **8.** Measurement of infiltration rate
3	**Biochem. 5.1. Fundamentals of Plant Biochemistry** **Credit hours: 3(2+1)** **Theory** 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 Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins. Introduction to secondary metabolites, Enzymes: General properties; Classification; Introduction to allosteric enzymes. Applications of enzymes.Vitamins and mineral nutrition for human health. Nucleic acids: Importance and classification; Chemical and physical properties of nucleic acids.Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Pentose phosphate pathway, Glyoxylate cycle, Electron transport chain. Substrate level and photo phosphoryla) reactiontion, Metabolism of lipids: Beta oxidation, Transamination reaction **Practicals** 1. Preparation of solution, pH & buffers 2. Qualitative tests of carbohydrates and amino acids 3.Quantitative estimation of glucose/ proteins 4. Titration methods for estimation of amino acids/lipids 5. Effect of pH, temperature and substrate concentration on enzyme action 6. Quantitative analysis of DNA and RNA 7.Estimation of ascorbic acid and calcium by titration method 8.Estimation of total phenols/plant pigments/total alkaloids
4	**GPB 5.3 Fundamentals of Plant Breeding** **Credit hours: 3(2+1)** **Theory** Historical development, concept, nature and role of plant breeding, major achievements; Modes of reproduction and apomixes; Self- incompatibility and male sterility, Domestication, acclimatization, introduction; Centre of origin/diversity, Genetic basis and breeding methods in self- pollinated crops- mass selection and pure line selection, hybridization techniques and handling of segregating population (pedigree, bulk, SSD and back cross methods); Multiline concept; Genetic basis and methods of breeding cross-pollinated crops; Heterosis and inbreeding depression; Development of inbred lines and hybrids, composite and synthetic varieties; Polyploidy in relation to plant breeding; Breeding for important biotic and abiotic stresses.

	Practicals 1. Plant Breeder's kit; 2. Study of germplasm of various crops (plant genetic resources, gene pool and its conservation) 3. Mode of pollination 4. To work out the mode of pollination in a given crop and extent of natural out crossing 5. Consequences of inbreeding on genetic structure of resulting populations 6. Emasculation and hybridization techniques in self and cross pollinated crops 7. Designs used in plant breeding experiments 8. Component of genetic variation- heritability and genetic advance
5	**Ag.Stat. 5.2 Statistical Methods** **Credit hours: 3(2+1)** **Theory** Introduction to Statistics and its Applications in Agriculture. Graphical Representation of Data, Measures of Central Tendency & Dispersion. Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Normal Distribution. Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation Linear Regression Equations. Introduction to Test of Significance, One sample & two sample test t for Means, Large sample test (Z test), Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table. Introduction to Analysis of Variance, Principle of experimental designs, Analysis of One Way Classification (CRD and RBD). Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample. **Practicals** 1. Graphical Representation of Data 2. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles& Percentiles 3. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles& Percentiles 4. Measures of Dispersion (Ungrouped Data) 5. Measures of Dispersion (Grouped Data) 6. Moments, Measures of Skewness & Kurtosis (Ungrouped Data) 7. Moments, Measures of Skewness& Kurtosis (Grouped Data) 8. Correlation & Regression Analysis 9. Application of One Sample t-test. 10 Application of Two Sample Fisher's t-test 11. Chi-Square test of Goodness of Fit 12. Chi-Square test of Independence of Attributes for 2 ×2 contingency table 13. Analysis of Variance One Way Classification 14. Selection of random sample using Simple Random Sampling.

6	**Ag. Micro. 5.1 Agricultural Microbiology Credit hours: 2(1+1)** **Theory** Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. 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. Biological nitrogen fixation- symbiotic, associative and asymbiotic, Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation. **Practicals** 1. Introduction to microbiology laboratory and its equipments 2. Microscope- parts, principles of microscopy, resolving power and numerical aperture 3. Methods of sterilization 4. Nutritional media and their preparations 5. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes 6. Methods of isolation and purification of microbial cultures 7. Isolation of *Rhizobium* from legume root nodule 8. Isolation of *Azotobacter* from soil 9. Isolation of *Azospirillum* from roots 10. Staining and microscopic examination of microbes.
7	**Ag. Ext. 5.1 Fundamentals of Extension Education and Communication** **Credit hours: 3(2+1)** **Theory** Extension Education: Definition, need, scope, importance, philosophy process, function and principles. Teaching-learning process, Learning situations. Extension Teaching methods and its classification. Projected and non projected audio visual aids i.e. charts, graphs, poster, leaflet, cards etc. Method and result demonstration, field trip. Communication-Meaning, definition and importance. Elements of communication process and adoption process, ICT in agriculture. Concept of KVK, SSK, ATMA, ATIC, FTC and Kisan call centre, Agribusiness and Agri clinic. Agricultural Journalism– Meaning, Scope and Importance, Sources of news, Types, Merits and Limitations. Brief about soil health card.

	Practicals 1. Identification of Audio-visual instruments and its classification 2. Preparation of Poster, Flash cards, Leaflets, folders-charts, graphs etc 3. Handling of Public Address System 4. Preparing PPT for LCD projector 5. Organization of method demonstration 6. Preparation of interview schedules for collecting information from farmers 7. Preparation of interview schedules for collecting information of village 8. Visit to SSK, ATIC, KVK and FTC etc
8	**Ag.Engg. 5.3 Farm Machinery and Power** **Credit hours: 3(2+1)** **Theory:** Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines , Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement, Criteria for write selection of tractor and machine implements Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations, sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, harvesting and threshing equipment. **Practicals** 1. Study of different components of I.C. engine 2. Familiarization with lubrication and fuel supply system of tractor 3. Familiarization with brake, steering, hydraulic control system of tractor 4. Familiarization with different types of primary and secondary tillage implements 5. Familiarization with seed-cum-fertilizer drills their seed metering mechanism and calibration 6. Familiarization with different types of sprayers and dusters 7. Familiarization with different inter-cultivation equipment 8. Familiarization with harvesting and threshing machinery 9. Calculation of power requirement for different implements 10. Use of tillage implements-reversible plough, one way plough, harrow and leveler

9	**LPM 5.2 Principles of Poultry Production and Management Credit hours :2(1+1)** **Theory:** Role of poultry in the national economy. Housing principles, space requirements for different classes of poultry birds poultry. Incubation, hatching and brooding. Management of growers and layers and broilers. Formation of egg. Important Indian and exotic breeds of poultry. Feed ingredients for ration, Feed supplements and feed additives. Feeding and nutrition of different classes of poultry. Prevention (including vaccination schedule) and control of important diseases of poultry. **Practicals** 1. External body parts and points of poultry 2. Identification methods for poultry 3. Study of judging and culling of poultry 4. Planning and layout of housing for different types of poultry 5. Hatchery operations, incubation and hatching equipments 6. Management of chicks, growers and layers 7. Debeaking, dubbing and vaccination 8. Economics of poultry production 9. Visit to IPF to study daily routine farm operations and farm records

SIX SEMESTER

Sr. No.	Subject Code and Title of Course
1	**Agron.6.10 Principles of Organic Farming Credit hours: 2(1+1)** **Theory** Organic farming, principles and its scope in India; Components of organic farming, Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP; Certification process and standards of organic farming; Processing, packaging, labeling, economic considerations and marketing and export potential of organic products. **Practicals** 1. Preparation of enrich FYM, compost, bio-fertilizers/bio-inoculants 2. Indigenous technology knowledge (ITK) for nutrient management 3. Non chemical approach for insect, pest disease and weed management 4. Cost of organic production system 5. Post harvest management; Quality aspect, grading, packaging and handling 6. Certification procedure for organic production 7. Visit of organic farms to study the various components and their utilization
2	**Agron.6.11 Vermicompost Credit hours 2(0+2)** Under experiential learning programme on vermicompost 20 vermibeds for a batch of 5-6 students will be prepared and maintained **Practicals** 1. Opportunity analysis, background and context 2. Erection of vermished 3. Preparation of vermibed and inoculation with earthworm 4. Management practices for maintaining micro climate i.e. temperature, humidity and protection from predators 5. Preparation of vermiwash 6. Value addition through enrichment of vermicompost through bio-fertilizer 7. Ready for sieving, Bagging, packing and storage 8. Marketing / Linkages and Visit of commercial vermicompost units
3	**GPB 6.4 Seed Production Technology Credit hours: 2(0+2)** **Practicals** 1. Seed production in major cereals- rice, maize, sorghum and bajra 2. Seed production in major pulses- pigeonpea, green gram, black gram, chickpea

	3. Seed production in major oilseeds- groundnut, sesame, soybean, mustard, castor 4. Seed production in cotton 5. Seed production in vegetable crops- tomato, brinjal, chillies and okra 6. Seed sampling and physical purity test 7. Germination and viability test 8. Seedling vigour test 9. Genetic purity test- grow out test 10. Procedure of seed certification 11. Field inspection and preparation of field inspection report 12. Study of GM crops 13. Visit to seed production farms 14. Visit to seed testing laboratories 15. Visit to seed processing plant
4	**Hort. 6.5 Preservation and Value Addition in Horticultural Crops** **Credit hours: 2 (0+2)** **Practicals** 1. Study of different types of tools & equipments used in preservation 2. Study of different types of preservatives 3. Canning of fruits and vegetables 4. Storage of canned products 5. Preparation of juice, squash, cordial and syrups 6. Preparation of jam and jelly 7. Preparation of candy and ketchup 8. Preparation of pickles 9. Pre harvest factors affecting quality on post harvest shelf life of fruits and vegetables 10. Factors affecting the microbial deterioration of fruits and vegetables 11. Study of different methods of drying of horticultural products, preservation and marketing 12. Chemicals used for hastening and delaying ripening of fruits and vegetables 13. Visit to local processing units and packing industries
5	**Hort.6.6 Green House Technology** **Credit hours: 2(0+2)** **Practicals** 1. Study of different types of green houses based on shape, construction and cladding materials 2. The study of fertigation requirements for greenhouse crops and estimation of E.C. in the fertigation solution 3. The study of various growing media used in raising of greenhouse crops and their preparation and pasteurization / sterilization 4. Construction of low cost green houses 5. Effect of green house environment on plant growth 6. Planning and maintenance of green house 7. Irrigation systems used in greenhouses

	8. Cultivation of gerbera in green house 9. Cultivation of dutch rose in green house 10. Cultivation of Capsicum in green house 11. Sources of green house materials 12. Study of nutrient film technique (NFT) / hydroponics 13. Packing and marketing of flowers 14. Visit to commercial green houses
6	**Pl. Path. 6.5 Mushroom Production Technology Credits hours: 2(0+2)** **Practicals** 1. Introduction to mushroom 2. Mushroom morphology 3. Isolation techniques for mushroom fungal culture and spawn production 4. Preparation of different substrates for growing mushroom 5. Preparation of beds/containers for growing of mushroom 6. a. Cultivation of Oyster mushroom b. Cultivation of button mushroom c. Cultivation of paddy/wheat straw mushroom d. Cultivation of milky mushroom 7. Pests and diseases of mushroom, their management and mushroom poisoning 8. Economics of mushroom production
7	**Ag. Ext. 6.2 Entrepreneurship Development Credit hours: 2 (1+1)** **Theory** Meaning and definition of Entrepreneurship, Characteristics of entrepreneurship, Entrepreneurial Competencies, Meaning and definition of Entrepreneur, Different roles of Entrepreneur, Types of entrepreneurs, Characteristics of ideal entrepreneurs, Identification of agricultural related entrepreneurial opportunities (Only examples) viz. Cultivation related, Inputs marketing related, Product marketing related, Processing and value addition related, Distributorship, Agent, Export Distributorship, Import Distributorship, Ethics in entrepreneurship, Preparation of project for small agricultural enterprise. **Practicals** 1. Preparation of project for small agricultural enterprise 2. Practical exposure with successful agro-enterprise 3. Practical exposure with successful poultry enterprise 4. Practical exposure with vermicompost production enterprise 5. Practical exposure with dairy enterprise 6. Practical exposure with Agro-service provider entrepreneur e.g. Pest control service provider or Kitchen garden service provider entrepreneur or Agro-export consultant