

Course Title: Principles of Nematology

Course Code: NEMA 501

Course Credit: 3(2+1)

THEORY

UNIT I

Characteristics of Phylum Nematoda and its relationship with other related phyla, history and growth of Nematology; nematode habitats and diversity- plant, animal and human parasites; useful nematodes; economic importance of nematodes to agriculture, horticulture and forestry.

UNIT II

Gross morphology of plant parasitic nematodes; broad classification, nematode biology, physiology and ecology.

UNIT III

Types of parasitism; nature of damage and general symptomatology; interaction of plant- parasitic nematodes with other organisms.

UNIT IV

Plant nematode relationships, cellular responses to infection by important phytonematodes; physiological specialization among phytonematodes.

UNIT V

Principles and practices of nematode management; integrated nematode management.

UNIT VI

Emerging nematode problems, Importance of nematodes in international trade and quarantine.

Practical

Studies on kinds of nematodes- free-living, animal, insect and plant parasites; nematode extraction from soil; extraction of migratory endoparasites, staining for sedentary endoparasites; examination of different life stages of important plant parasitic nematodes, their symptoms and histopathology

Course Title: Structural and Functional Organization of Nematodes

Course Code: NEMA 503

Course Credit: 3(2+1)

Theory

UNIT I

Introduction and general organization of nematode body; Morphology and anatomy of nematode cuticle, hypodermis, musculature and pseudocoelom.

UNIT II

Digestive system- structural variations of stoma, oesophagus, intestine and rectum in nematodes.

UNIT III

Reproductive system- Variations in female and male reproductive systems, types of reproduction, spermatogenesis and oogenesis.

UNIT IV

Types and structure of excretory-secretory systems; nervous system and associated sense organs.

UNIT V

Embryogenesis, Cell lineage and postembryonic development; Process of hatching and moulting.

Practical

Studies on variations in nematode shapes and sizes, morphological details of cuticle, cuticular markings and ornamentation, variations in stoma, oesophagus, rectum; types and parts of female and male reproductive systems, sense organs, and excretory system.

Course Title: Nematode Systematics

Course Code: NEMA 504

Course credit: 3(2+1)

THEORY

UNIT I

Gross morphology, principles of nematode taxonomy -levels of taxonomy, systematics vs. taxonomy, morpho-taxonomy, molecular taxonomy, identification, classification, taxonomic categories, taxonomic characters, morphometry, Zoological nomenclature, species concept and speciation (allopatric and sympatric).

UNIT II

Taxonomic position of nematodes and their relationships with allied groups; Classification and diagnoses of nematodes up to ordinal rank (Secernentea and Adenophorea)

UNIT III

Taxonomy of free living nematodes

UNIT IV

Classification of plant parasitic nematodes; Order Tylenchida and diagnoses of its sub-orders, super families, families and important genera; Order Aphelenchida, Dorylaimida and Triplonchida and diagnoses of their important genera.

PRACTICAL

Collection of soil and plant samples from different habitats, processing and preservation of samples; and preparation of temporary mounts, processing of nematode specimens and permanent mounts. Preparation of *en face* view and TS of nematodes, perineal pattern of root knot nematodes and cone-top structure for cyst nematodes. Identification of soil and plant nematodes from nematode suspension and mounted slides. Camera lucida drawing of nematodes, measurement of nematodes using traditional as well as image analyzing software. Procedures for PCR- Taxonomy.

Course Title: Techniques in Nematology

Course Code: NEMA 505

Course Credit: 3(1+2)

THEORY

UNIT I

Principles and use of light, scanning and transmission electron microscopes, and other laboratory equipments.

UNIT II

Survey and surveillance methods; collection of soil and plant samples; techniques for extraction of nematodes from soil and plant material; estimation of population densities.

UNIT III

Killing, fixing, clearing and mounting nematodes; measurements, preparation of perineal patterns, vulval cones of cyst nematodes, en-face views and body section of nematodes.

UNIT IV

In vitro and *in vivo* culturing techniques of plant parasitic, bacteriophagous, mycophagus and omnivorous nematodes.

UNIT V

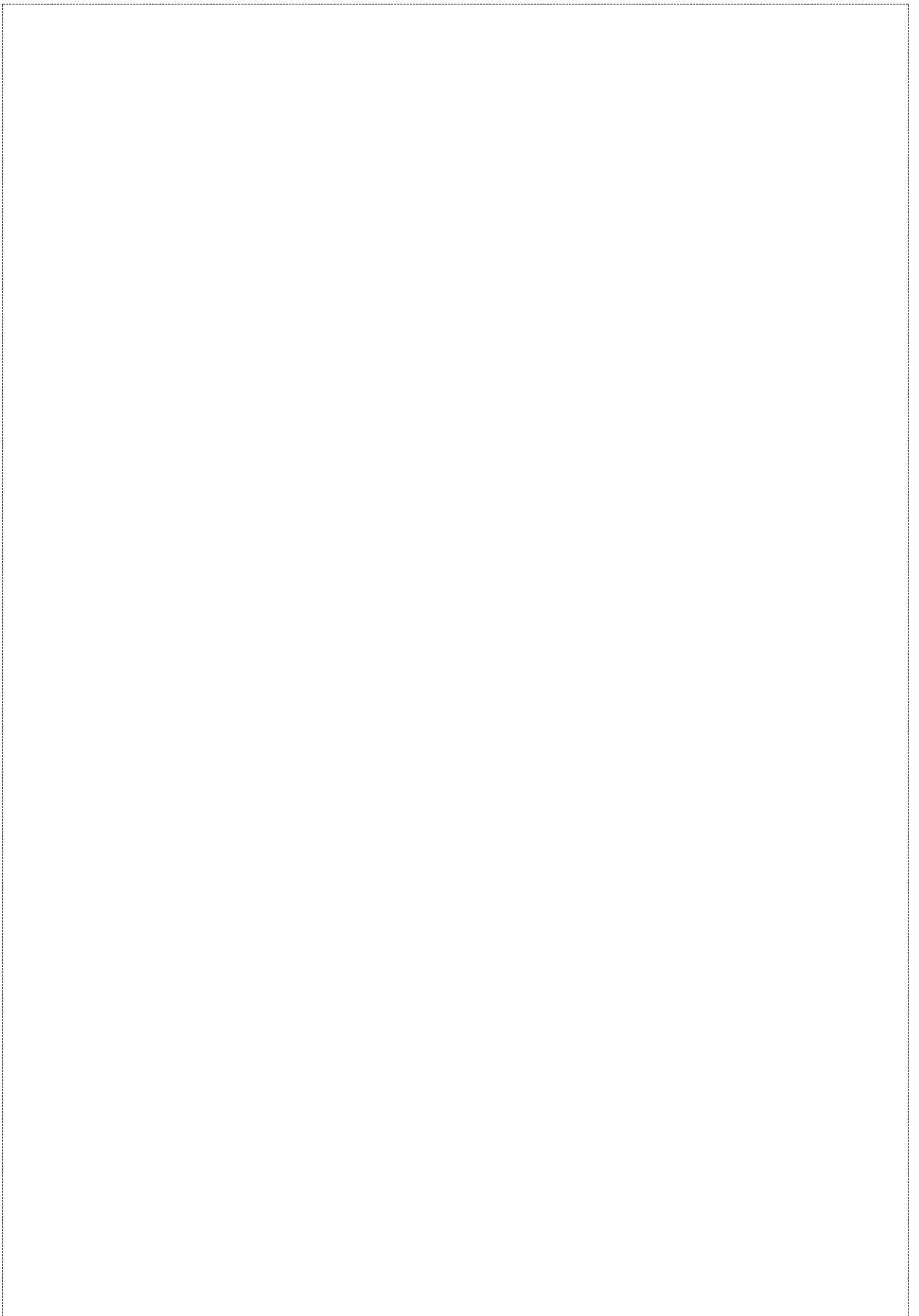
Staining nematodes in plant tissues; microtomy for histopathological studies; collection of plant root exudates and their bioassay; preparation of plant materials for exhibition.

UNIT VI

Application of molecular techniques in Nematology.

PRACTICAL

Collection of soil and plant samples; extraction of nematodes from soil by Baermann funnel, sieving and decanting, elutriation and sugar centrifugal methods; extraction of cysts from soil; extraction of nematodes from plant material; estimation of population densities; staining plant material for nematodes; killing and fixing nematodes, clearing nematodes by slow and Seinhorst's methods; preparation of temporary and permanent mounts; measurements, drawing, microphotography, special preparation of nematodes - perineal patterns, vulval cones, *en-face* and body sections; collection of root exudates, preparation of exhibits of nematode diseased plant material, *in vitro* culturing techniques of nematodes- callous culture, excised root and carrot disc techniques.



Course Title: Nematode Diseases of Crops

Course Code: NEMA 506

Course Credit: 3(2+1)

THEORY

Diagnosis of causal organism, distribution, host range, biology and life cycle, nature of damage, symptoms, interaction with other organisms, and management of nematode diseases in different crops.

UNIT I

Cereal crops- Ear-cockle and *tundu* diseases of wheat, *molya* disease of wheat and barley; rice root nematode, rice root-knot and cyst nematode problems, *ufra* and white tip diseases of rice; lesion nematodes, cyst nematodes of maize and sorghum.

UNIT II

Pulses, Sugar, Fibre, Fodder and Oilseed crops- Pigeon pea cyst nematode, root knot nematode, reniform nematode, lesion, lance nematode, sugarbeet cyst and soybean cyst nematode problems.

UNIT III

Vegetable crops- root-knot disease, reniform nematode, potato cyst nematode; stem and bulb nematode. Nematode problems of protected cultivation.

UNIT IV

Fruit crops- root-knot nematode, reniform nematode, slow decline of citrus. Flowers- root-knot nematode, foliar nematodes, bulb nematodes, Mushroom- nematode problems.

UNIT V

Plantation, medicinal and aromatic crops- burrowing nematode problem of banana, spices and condiments, root-knot and lesion nematode problems of coffee and tea, red ring disease of coconut. Forests- Pine wilt disease.

PRACTICAL

Diagnosis of causal organisms; identification of different life cycle stages; study of symptoms and histopathology of nematode damage in different crops, study tours for field diagnosis of nematode problems.

Course Title: Nematode Management

Course Code: NEMA 510

Course Credit: 3(2+1)

THEORY

UNIT I

Concepts and history of nematode management; crop loss estimation, ecological and socio-economic aspects, cost-benefit ratios and pest risk analysis.

UNIT II

Chemical methods- nematicides, their types, classification, mode of action, applicators and application methods, antidotes, and economizing nematicidal use.

UNIT III

Cultural practices- crop rotations and cropping sequences, fallowing, flooding, soil solarisation, time of sowing, organic amendments of soil, bio- fumigation, antagonistic and trap crops, sanitation, etc.

Physical methods- use of heat, hot water treatment and other methods of disinfestations of planting material.

UNIT IV

Biological methods- concepts and terminology, use of predators and parasites as biological control agents, their mass multiplication and field use; phytotherapeutic methods – use of antagonistic plants and antinemic plant products.

UNIT V

Genetic methods- plant resistance; legal methods- quarantine regulations; integrated nematode management- concepts and applications.

PRACTICAL

In vitro screening of synthetic chemicals and plant products for nematicidal activity, and their application methods; methods for screening of crop germplasm for resistance against nematodes, laboratory exercises on biocontrol potential of fungal, bacterial parasites, and predacious fungi and nematodes.

Course Title: Beneficial Nematodes

Course Code: NEMA 511

Course Credit: 2(1+1)

THEORY

UNIT I

Beneficial nematode fauna - predators, parasites of insects, molluscs and other pests; Entomophilic nematodes- important groups, types of nematode- insect associations; taxonomic characteristics of nematode parasites of insects.

UNIT II

Host-parasite relations and life cycle of mermithids, entaphelenchids, thelastomids, sphaerularids and tylenchids.

UNIT III

Entomopathogenic nematodes- *Steinernema*, *Heterorhabditis*, *Oscheius* their morphological characteristics, taxonomic status, biology and mode of action.

UNIT IV

Entomopathogenic nematodes- mass multiplication techniques, formulations, field applications and efficacy, success stories.

UNIT V

Nematodes as biological models, nematodes as indicators of pollution, role of nematodes in organic matter recycling.

PRACTICAL

Isolation, identification, mass rearing and application methods of entomopathogenic nematodes.