

## B.Sc. (Agriculture)

### Semester wise distribution of courses

#### I Year II Semester

S. No.	Course No.	Course Title	Credit Hours
1.	AGR 102	Fundamentals of Agricultural Meteorology	1+1
2.	BIC 101	Fundamentals of Biochemistry	2+1
3.	CRP 101	Fundamentals of Plant Physiology	2+1
4.	AEC 101	Principles of Economics	1+1
5.	SER 121	Principles and practices of sericulture	1+1
6.	ENS 101	Principles of Environmental Sciences	1+1
7.	FSN 111	Principles of Food Science and Nutrition	1+1
8.	FOR 111	Agro Forestry	1+ 1
9.	TAM 101	இலக்கியங்களில் வேளாண்மையும் அறிவியல் தமிழ் பயனாக்கமும்	0+1
	ENG 103	Development Education	
10.	NSS/ NCC 101	National Service Scheme/ National Cadet Corps	Regd. in I Sem
11.	PED 101	Physical Education	
12.	PED 102	Yoga for Human Excellence	
		Total	10+9=19

**Theory:****Unit - I:**

Meteorology - Agricultural Meteorology - Importance and scope in crop production - Co-ordinates of India and Tamil Nadu - Atmosphere - Composition and vertical layers of atmosphere (stratification) - Climate - Weather - Factors affecting climate and weather - Climatic types - Different agricultural seasons of India and Tamil Nadu and climatic characteristics of India.

**Unit - II:**

Solar radiation - Light intensity, quality, direction and duration - Air and Soil temperature - Diurnal variation - importance in crop production. Heat unit and its importance in agriculture. Relative Humidity and its importance - vapor pressure deficit and its importance - Wind and its effect on crops.

**Unit - III:**

Atmospheric pressure - Pressure systems - cyclones, anticyclones, tornado, hurricane and storms - Wind systems of the world - Inter Tropical Convergence Zone. Clouds - types and their classification. Precipitation - forms - monsoon - Seasons of India- rainfall variability drought, flood and their effect - Cloud seeding - Evaporation - transpiration - Evapotranspiration - PET.

**Unit - IV:**

Agro climatic Zones of India and Tamil Nadu - Agro climatic normals - Weather forecasting - synoptic chart - crop weather calendar - Remote sensing and crop weather modeling - Impact of climate and weather on crop production and pest and diseases.

**Unit - V:**

Climate change- climate variability - definition and causes of climate change - Impact of climate change on Agriculture, Forestry, Hydrology, marine and coastal ecosystem

**Practical:**

Observatory - Site selection and layout. Acquiring skill in use of Pyranometers - Sunshine recorder - Maximum, Minimum, Grass minimum and Soil thermometers - Thermograph, Dry and wet bulb thermometers - Hygrograph - Psychrometers - Fortein's barometer - Barograph - Altimeter; Wind vane, Anemometer - Rain gauge - Ordinary and self-recording - Dew gauge; Automatic weather station - Evaporimeters - Lysimeters, Automatic weather station - Preparation of synoptic charts and crop weather calendars. Rainfall probability analysis. Mapping of Agroclimatic Zones.

### **Theory - Lecture Schedule:**

1. Meteorology - Agricultural Meteorology - Definition, their importance and scope in crop production.
2. Coordinates of India and Tamil Nadu. Atmosphere - Composition of atmosphere - Vertical layers of atmosphere based on temperature difference / lapse rate.
3. Climate and weather - Factors affecting climate and weather. Macroclimate - Meso climate - Microclimate - Definition and their importance - Different climates of India and Tamil Nadu and their characterization.
4. Solar radiation - Radiation balance - Wave length characteristics and their effect on crop production - Light - effect of intensity, quality, direction and duration on crop production.
5. Air temperature - Factors affecting temperature. Diurnal and seasonal variation in air temperature - Isotherm, Heat unit and its use - Heat and cold injuries.
6. Role of temperature in crop production. Soil temperature - Importance in crop production. Factors affecting soil temperature, diurnal and seasonal variation in soil temperature.
7. Humidity - Types - Dew point temperature - Vapour pressure deficit - Diurnal variation in Relative humidity and its effect on crop production - Wind and its role on crop production.
8. **Mid Semester Examination.**
9. Atmospheric pressure, diurnal and seasonal variation - Pressure systems of the world - causes for variation - Isobar - Low, depression, anticyclone, Tornado, hurricane.
10. Wind systems of the world - Inter Tropical Convergence Zones (ITCZ), wind speed in different seasons -. Clouds and their classification - Concepts of cloud seeding - present status.
11. Precipitation - Forms of precipitation - Isohyte - Monsoon - Different monsoons of India - Rainfall variability - Drought and flood - Impact on crop production.
12. Evaporation - Transpiration, evapotranspiration - Potential evapotranspiration - Definition and their importance in agricultural production. Agroclimatic zones of Tamil Nadu - Agroclimatic normals for field crops.
13. Weather forecasting - Types, importance, Agro Advisory Services - Synoptic chart - Crop weather calendar.

14. Remote sensing and its application in agriculture - Crop weather modeling and its application in agriculture - list of models available.
15. Effect of weather and climate on crop production, soil fertility and incidence of pest and diseases.
16. Climate change, climate variability - definition and causes of climate change including ENSO.
17. Impact of climate change on Agriculture, Forestry, Hydrology, marine and coastal ecosystem.

**Practical schedule:**

1. Site selection and layout for Agromet Observatory - Calculation of local time - Time of observation of different weather elements - Reviewing agromet registers.
2. Measurements of solar radiation (pyranometers), sunshine hours (sunshine recorder) - working out weekly and monthly mean for graphical representation.
3. Measurement of air and soil temperature and grass minimum thermometers and thermographs - drawing isolines.
4. Humidity measurements - use of wet and dry bulb thermometers - Psychrometers - Hygrograph - Measurement of wind direction and wind speed and conversion (KMPH, KNOT, and M/Sec.) - Beaufort's scale.
5. Measurement of atmospheric pressure - barograph - Fortein-s barometer - Isobars based on past data for different seasons.
6. Measurement of rainfall - Ordinary and self-recording rain gauges - Measurement of Dew - dew gauge- study of Automatic weather station.
7. Measurement of Evaporation - Open pan evaporimeter- application of evaporation data- Measurement of Evapotranspiration- Lysimeter.
8. Heat Unit concept- GDD, HTU, PTU for fixing time of sowing.
9. Probability analysis of rainfall for crop planning.
10. Drawing Synoptic charts for understanding weather.
11. Preparation of crop weather calendars and forecast based agro advisories
12. Preparation pest weather calendar and pest forewarning.
13. Estimation of length of growing periods using weekly rainfall data.
14. Water balance studies.
15. Identification of efficient cropping zone- RYI, RSI.
16. Mapping of agro climatic Zones of India and Tamil Nadu and its characterization.
17. **Practical Examination.**

**References:**

Prasad, Rao, G.S.L.H.V. 2005. Agricultural Meteorology. Kerala Agricultural University, Press, Thrissur.

Mavi, H.S., 1996. Introduction to Agrometeorology, oxford and IBH Publishing Co., New Delhi.

Gopaldaswamy, N. 1994. Agricultural Meteorology, Rawat publications, Jaipur.

**E:References:**

[www.tawn.tnau.ac.in](http://www.tawn.tnau.ac.in)

[www.usbr.gov/pn/agri.met](http://www.usbr.gov/pn/agri.met)

[www.imd.gov.in](http://www.imd.gov.in)

**OBJECTIVE**

- To gain basic knowledge of the biomolecules viz., Carbohydrates, Proteins and Lipids - properties, structure and metabolism.
- To learn basics of enzymes

**Theory****UNIT I Carbohydrates**

Carbohydrates - occurrence and classification. Structure of monosaccharides, **oligosaccharides** and polysaccharides. Physical and chemical properties of carbohydrates – optical isomerism, optical activity, mutarotation, reducing property, reaction with acids and alkalies. **Glycoconjugates - Glycoproteins and Lectin - structure and significance.**

**UNIT II Lipids**

Lipids - occurrence and classification. Storage lipids - fatty acids, triacyl glycerol, essential fatty acids, waxes. **Structural lipids - role of lipids in biological membrane - glycolipids** and phospholipids - types and importance; Sterols - basic structure and their importance. Physical and chemical constants of oils. Rancidity of oils.

**UNIT III Proteins and Enzymes**

Amino acids - classification and structure. Essential amino acids. Properties of amino acids - amphoteric nature and isomerism. Classification of proteins based on functions and solubility. Structure of proteins: primary structure, secondary structure, tertiary structure and quaternary structure - **protein folding and denaturation.** Properties and reactions of proteins. Enzymes - Properties, classification and nomenclature. Mechanism of enzyme action. Factors affecting enzyme activity. Enzyme inhibition - Competitive, Non-competitive and Uncompetitive inhibition; **Allosteric enzymes.** Coenzymes, cofactors and isoenzyme.

**UNIT IV Metabolism**

Carbohydrate metabolism - breakdown of starch by amylases, glycolysis, TCA cycle and pentose phosphate pathway. Respiration - electron transport chain and oxidative phosphorylation. Bioenergetics of glucose. Lipid metabolism - lipases and phospholipases. Beta-oxidation of fatty acids and bioenergetics. Biosynthesis of fatty acids and triacyl glycerol. General catabolic pathway for amino acids - transamination, deamination and decarboxylation. Ammonia assimilating enzymes. Metabolic inter-relationship.

## **UNIT V Secondary metabolites**

Secondary metabolites - occurrence, classification and functions of phenolics, terpenes and alkaloids.

### **Lecture schedule**

1. Introduction to Biochemistry, Carbohydrates - occurrence and classification R2: 1-4, 66-72.
2. Structure of monosaccharides. R2: 75-82.
3. Structure of oligosaccharides and polysaccharides. R2: 82-90.
4. Physical properties of carbohydrates - Mutarotation, optical activity, isomerism. R2: 73-78.
5. Chemical reactions of carbohydrates. R2: 90-95.
6. Glycoproteins and lectin - structure and significance. R1: 316-321.
7. Lipids - occurrence and classification. R2: 99-100.
8. Storage lipids - Fatty acids and triacyl glycerol. Essential fatty acids, waxes. R2: 101-106.
9. Structural lipids - Glycolipids and phospholipids - types and importance. R2: 107-111.
10. Sterols - basic structure and their importance. R2: 111-114.
11. Physical and chemical constants of oils. Rancidity of oils. R2: 114-119.
12. Amino acids - Classification and structure. R2: 17-21.
13. Properties of amino acids - amphoteric nature, isomerism, essential amino acids. R2: 21-26.
14. Classification of proteins based on function and solubility. R2: 26-31.
15. Structure of protein - Primary, secondary, tertiary and quaternary structure. R2: 31-41.
16. Protein folding, physical and chemical properties of proteins. R2: 41-43, R1: 52-55.
17. **MIDSEMESTER EXAMINATION**
18. Enzymes - Properties, classification and nomenclature. R2: 123-127.
19. Mechanism of enzyme action. R2: 129-131.
20. Factors affecting enzyme activity. R2: 131-136.
21. Enzyme inhibition - competitive, non-competitive, uncompetitive and allosteric enzymes. R2: 136-137, R1: 224-225.
22. Coenzymes, cofactors and isoenzyme. R2: 127-129, 138.
23. Carbohydrate metabolism - breakdown of starch by amylases, Glycolysis - Reactions and bioenergetics. R2:159-164.
24. TCA cycle - Reactions and bioenergetics. R2: 164-168.
25. Pentose phosphate pathway - Reactions . R2: 174-177.
26. Respiration - electron transport chain and oxidative phosphorylation. R2: 170-173.
27. Lipid metabolism - lipases and phospholipases. R2: 205-208.
28. Beta-oxidation of fatty acids and bioenergetics. R2: 208-212.
29. Biosynthesis of fattyacids and triacylglycerol. R2: 213- 220.
30. Transamination, deamination and decarboxylation of amino acids. R2: 224-231.
31. Ammonia assimilating enzymes - GS, GOGAT and GDH. R2: 231-233.

32. Metabolic inter-relationship. R2: 287-289.
33. Secondary metabolites - occurrence, classification and functions of phenolics. R2: 274-276.
34. Occurrence, classification and functions of terpenes and alkaloids. R2: 277-280.

### Practical

1. Qualitative analysis of carbohydrates
2. Estimation of starch
3. Estimation of amylose
4. Determination of reducing sugars
5. Qualitative analysis of amino acids
6. Sorenson's formal titration of amino acids
7. Estimation of amino acids by Ninhydrin method
8. Estimation of protein by Biuret method
9. Determination of free fatty acid of an oil
10. Determination of iodine number of an oil
11. Estimation of ascorbic acid by dye method
12. Assay of amylase
13. Estimation of total phenols
- 14. Extraction and estimation of lycopene and carotenoids**
15. Separation of amino acids by paper chromatography
16. Separation of **phenols** by thin layer chromatography
17. Final Practical Examination

### References

1. Berg JM, Tymoczko JL and Stryer L, (2007), Biochemistry, 7<sup>th</sup> Ed. Wiley Eastern Ltd. ISBN:0-7167-8724-5.
2. Thayumanavan, B, Krishnaveni, S and Parvathi, K, (2004), Biochemistry for Agricultural Sciences, Galgotia Publications Pvt Ltd., New Delhi. ISBN :81-7515-459-4.

### Teaching Resources

1. Cox, MM and Nelson, DL. (2011), Principles of Biochemistry, Fourth (Indian edition) Macmillan, Worth Publishers. <http://bcs.whfreeman.com/lehninger6e> - Web links/ Tutorials/ Lecture companion Art
2. Harper's illustrated Biochemistry -<https://freemedeblogs.files.wordpress.com/2014/01/harpers-illustrated-biochemistry-28th-edition.pdf>
3. J M Berg, J L Tymoczko and L Stryer , Biochemistry, Sixth Edition - <http://www.irb.hr/users/precali/Znanost.o.Moru/Biokemija/Literatura/Lubert%20Stryer%20-%20Biochemistry.pdf>
4. Sadasivam, S and Manickam, A. (2009), Biochemical Methods, 3<sup>rd</sup> Edn, New Age International.
5. Wilson, K. and Walker, J.M. (2000), Principles and techniques of Practical Biochemistry, 5<sup>th</sup> Edn. – Cambridge University Press.
6. [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov)



**Aim**

To impart basic knowledge on various functions and processes related to crop production, mineral nutrition, plant growth regulators and environmental stresses.

**Syllabus****Unit I: Plant Water Relations**

Importance of Crop Physiology in Agriculture – cell organelle- plasma membrane, chloroplast, mitochondria, peroxisome and vacuole - Structure and role of water –water potential and its components – diffusion – osmosis – imbibition - plasmolysis – Field Capacity and Permanent Wilting Point- Mechanisms of water absorption – Pathways of water movement – Apoplast and symplast - Translocation of water – ascent of sap – mechanisms - Transpiration – significance – structure of stomatal pore- mechanisms of stomatal opening and closing – guttation – antitranspirants

**Unit II: Plant Mineral Nutrition**

Criteria of essentiality - classification of nutrients – macro, micro, mobile, beneficial elements and immobile – mechanism of nutrient uptake- Physiological functions, deficiencies and disorders of macro and micro nutrients – Hidden hunger- Foliar nutrition- root feeding and fertigation – sand culture, hydroponics and aeroponics

**Unit III: Photosynthesis and Respiration**

Light reaction – Photosystems- red drop and Emerson enhancement effect- Photolysis of water and photophosphorylation - Z scheme - Photosynthetic pathways – C<sub>3</sub> and C<sub>4</sub>, CAM – difference between three pathways - Factors affecting photosynthesis- Photorespiration – pathway and its significance - Phloem transport – Munch hypothesis - Phloem loading and unloading - Source and sink strength and their manipulations - Glycolysis – TCA cycle - Oxidative phosphorylation – difference between photo and oxidative phosphorylation – energy budgeting - respiratory quotient

**Unit IV: Growth and Development**

Growth – phases of growth - Factors affecting growth – Hormones- classifications - Biosynthetic pathway and role of auxins - Biosynthetic pathway and role of gibberellins and cytokinins- Biosynthetic pathway and role of ethylene and ABA- Novel and new

generation PGR's – Brassinosteroids and salicylic acid - Growth retardants – Commercial uses of PGR's- Photoperiodism - short, long and day neutral plants – Chailakhyan's theory of flowering-Forms of phytochrome - Pr and Pfr - regulation of flowering - Vernalisation - Theories of vernalisation – Lysenko and Chailakhyan's theories- Seed germination - physiological and biochemical changes - seed dormancy and breaking methods - Senescence and abscission – physiological and biochemical changes -Physiology of fruit ripening- climacteric and non-climacteric fruits - factors affecting ripening- Manipulations

### **Unit V: Stress Physiology**

Classification of stresses - Physiological changes and adaptations to drought, flooding, high and low temperature, salinity and UV radiation – compatible osmolytes – membrane properties — compartmentalization – stress alleviation - Global warming – green house gases – physiological effects on crops - Carbon Sequestration

### **Practicals**

Preparation of different types solutions -Measurement of plant water potential by different methods - Estimation of photosynthetic pigments- Chlorophylls and Carotenoids - Determination of stomatal index and stomatal frequency - Measurement of leaf area by different methods Physiological and Nutritional disorders in crops plants -Estimation of chlorophyll Stability Index - Estimation of Relative Water Content -Determination of photosynthetic efficiency in crop plants – soluble protein - Estimation of Nitrate Reductase activity -Growth Analysis - Bioassay of Cytokinin and GA - Estimation of proline - Demonstration of Practical applications of PGRs. Field visit for foliar diagnosis

### **Theory lecture schedule**

1. Importance of Crop Physiology in Agriculture – Structure of plasma membrane, chloroplast, mitochondria, peroxisome and vacuole
2. Structure and role of water –water potential and its components – Diffusion – Osmosis – imbibition – Plasmolysis - Field Capacity and Permanent Wilting Point
3. Mechanisms of water absorption – Pathways of water movement – Apoplast and symplast
4. Translocation of water – ascent of sap – mechanisms of xylem transport
5. Transpiration – significance – structure of stomata - mechanisms of stomatal opening and closing – guttation - antitranspirants

6. Mineral nutrition – criteria of essentiality - classification of nutrients – macro, micro, mobile and immobile – mechanism of nutrient uptake
7. Physiological functions and disorders of macro nutrients – Hidden hunger
8. Physiological functions and disorders of micro nutrients
9. Foliar nutrition- root feeding and fertigation – sand culture, hydroponics and aeroponics
10. Light reaction – photolysis of water and photophosphorylation - Z scheme
11. Photosynthetic pathways – C<sub>3</sub> and C<sub>4</sub> cycles
12. CAM pathway – difference between three pathways - Factors affecting photosynthesis.
13. Photorespiration – pathway and its significance
14. Phloem transport – Munch hypothesis - Phloem loading and unloading - Source and sink strength and their manipulations
15. Glycolysis – TCA cycle
16. Oxidative phosphorylation – difference between photo and oxidative phosphorylation – energy budgeting - respiratory quotient
17. Mid Semester Examination
18. Growth – phases of growth – factors affecting growth – Hormones- classifications
19. Biosynthetic pathway and role of auxins
20. Biosynthetic pathway and role of gibberellins and cytokinin
21. Biosynthetic pathway and role of ethylene and ABA
22. Novel growth regulators – Brassinosteroids and salicylic acid – New Generation PGR's
23. Growth retardants and inhibitors -commercial uses of PGR's
24. Photoperiodism - short, long and day neutral plants – Chailakhyan's theory of flowering
25. Forms of phytochrome - Pr and Pfr - regulation of flowering
26. Vernalisation - theories of vernalisation – Lysenko and Chailakhyan's theories
27. Seed germination - physiological and biochemical changes - seed dormancy and breaking methods
28. Senescence and abscission – physiological and biochemical changes

29. Physiology of fruit ripening- climacteric and non climacteric fruits - factors affecting ripening and manipulations
30. Drought - physiological changes - adaptation – compatible osmolytes - alleviation
31. High and low temperature stress – physiological changes - membrane properties - adaptation
32. Salt stress - physiological changes - adaptation – compartmentalization - alleviation
33. Flooding and UV radiation stresses – physiological changes - adaptation
34. Global warming – green house gases –physiological effects on crop productivity- Carbon Sequestration

### **Practicals schedule**

1. Preparation of different types solutions
2. Measurement of plant water potential by different methods
3. Estimation of photosynthetic pigments- chlorophylls and Carotenoids
4. Determination of stomatal index and stomatal frequency
5. Measurement of leaf area by different methods
6. Physiological and Nutritional disorders in crops plants
7. Estimation of chlorophyll Stability Index
8. Estimation of Relative Water Content
9. Determination of photosynthetic efficiency in crop plants – soluble protein
10. Estimation of Nitrate Reductase activity
11. Growth Analysis - LAI, LAD, SLA, SLW, LAR, NAR, RGR, CGR and HI
12. Bioassay of Cytokinin
13. Bioassay of GA
14. Estimation of proline
15. Demonstration of Practical applications of PGRs.
16. Field visit for foliar diagnosis
17. Final Practical Examination

## **Outcome**

Students will come to know basic knowledge on various functions and processes related to crop production, mineral nutrition, plant growth regulators and environmental stresses. In addition, hands on exposure to preparation of solutions, analysis of pigment composition, estimation of growth analytical parameters, diagnosis and correction of nutrient deficiencies, enzyme assays and demonstration of plant growth regulator applications

## **Text books**

1. P. Boominathan, R. Sivakumar, A. Senthil, and D. Vijayalakshmi. 2014. Introduction to Plant Physiology, A.E. Publications. Coimbatore
2. Jain, V.K. 2007. Fundamentals of plant physiology, S.Chand & Company Ltd., New Delhi.
3. Taiz. L. and Zeiger. E., 2010 (Fifth edition). Plant Physiology. Publishers: Sinauer Associates, Inc., Massachusetts, USA.

## **e- books and e-references**

- <http://www.plantphys.org>
- [http://www. Biologie. Uni-hamburg. de/b-online](http://www.Biologie.Uni-hamburg.de/b-online)
- <http://4e.plantphys.net>

**Objective**

This course aims to introduce the basic principles of economics including the problem of economic decision - making, laws of economics and macroeconomic concepts.

**Theory****Unit 1: Nature and Scope of Economics**

Nature and Scope of economics: Importance, Subject matter: Science Vs. art, Positive science Vs. normative science, Deductive method Vs. inductive method - Definitions of Economics: Wealth, Welfare, Scarcity and Growth - Different economic systems: merits and demerits - Divisions of Economics - Microeconomics and Macroeconomics - Agricultural Economics: Definition and scope - Basic concepts: Goods, Service, Value, Cost, Price, Wealth and Welfare - Wants: Characteristics and classification.

**Unit 2: Theory of Consumption**

Utility: Definition, Measurement: Cardinal and ordinal utility, Marginal utility - Law of Diminishing Marginal Utility and Law of Equi-marginal Utility: Definition, Assumptions, Limitations and Applications - Indifference curve analysis: Definition and properties of indifference curves and budget line - Demand: Definition, Kinds of demand, Demand schedule, Demand curve, Law of Demand, Determinants of demand, Extension and Contraction of demand Vs. Increase and decrease in demand - Elasticity of Demand: Types, Degrees of price elasticity of demand, Factors influencing elasticity of demand, Importance of elasticity of demand – Standard of Living: Definition, Engel's Law of Family Expenditure - Consumer surplus: Definition and Importance.

**Unit 3: Theory of Production**

Concept of production – Factors of production – Land: Characteristics of land - Labour: Characteristics of labour, Division of labour, Malthusian and Modern theories of population – Capital: Characteristics of capital, Capital formation – Entrepreneur: Characteristics and functions of entrepreneur. Supply: definition, Law of Supply, Factors influencing supply - Elasticity of Supply – Producer surplus.

**Unit 4: Exchange and Theory of Distribution**

Exchange and Distribution: Definition – Pricing of factors of production - Marginal productivity theory of distribution - Rent and Quasi rent - Wages: Real wage and money wage - Interest: Pure interest and gross interest – Profit: Meaning of economic profit.

## **Unit 5: Macroeconomic Concepts**

Macroeconomics: Definition and Subject matter – National Income: Concepts – GNP, GDP, NNP, Disposable income and Per capita income – Money: Definition, Types and functions of money - Inflation: Meaning, types of inflation - Public Finance: Meaning, Principles - Public Revenue: Meaning, Classification of taxes - Canons of Taxation - Public expenditure: Principles – Welfare Economics: Meaning, Pareto's optimality.

### **Practical**

Ten principles of economics - Law of Diminishing Marginal Utility - Law of Equi-Marginal Utility - Indifference Curve analysis and consumer equilibrium - Individual and market demand- Measurement of Arc and Point elasticities of demand - own price, income and cross price elasticities of demand – Estimation of Consumer surplus – Law of Diminishing Marginal Returns: Relationship among TPP, APP and MPP - Cost concepts and graphical derivation of cost curves - Estimation of total revenue and profit - Producer surplus - Supply elasticity – Exchange: Market Structure and Price determination – Theories of Distribution – Computation of National Income – Study of structural changes in the economy - Estimation of Growth Rate - Money: Quantity theory of money - Inflation: Causes and control measures – Estimation of price index - Measures of standard of living – Indices of human development.

### **Theory Schedule**

1. Nature and Scope of economics: Importance, Subject matter: Science Vs. art, Positive science Vs. normative science, Deductive method Vs. inductive method - Different economic systems: merits and demerits.
2. Definitions of Economics - Wealth, Welfare, Scarcity and Growth- Divisions of Economics: Micro economics and Macroeconomics - Agricultural Economics: Definition and scope.
3. Basic concepts – Goods, Services, Use value and Exchange value, Cost, Price, Wealth and Welfare - Wants: Characteristics and Classification of wants.
4. Utility: Definition, Measurement: Cardinal and ordinal utility - Marginal utility - Law of Diminishing Marginal Utility.
5. Law of Equi-marginal Utility: Definition, Assumptions, Limitations and Applications - Indifference curve analysis: Definition and properties of indifference curves and budget line.

6. Demand: Definition, Kinds of demand, Demand schedule, Demand curve, Law of Demand, Determinants of demand - Extension and contraction of demand Vs. Increase and decrease in demand.
7. Elasticity of Demand: Own price, cross price and income elasticities of demand, Degrees of price elasticity of demand, Factors influencing elasticity of demand and Importance of Elasticity of demand.
8. Standard of Living – Definition, Engel’s Law of Family Expenditure – Consumer surplus: Definition and Importance.
9. **Mid Semester Examination.**
10. Concept of production – Factors of production – Land and its characteristics.
11. Labour: Characteristics of labour - Division of labour - Malthusian and Modern theories of population.
12. Capital: Characteristics of capital - Capital formation: Phases of capital formation - Entrepreneur: Characteristics and functions of entrepreneur.
13. Supply: Definition, Law of Supply, Factors influencing supply - Elasticity of supply - Producer surplus.
14. Exchange and Distribution: Definition – Pricing of factors of production - Theory of distribution – Marginal productivity theory of distribution - Rent and Quasi rent.
15. Wages: Real wage and money wage – Interest: Pure interest and gross interest – Profit: Meaning of economic profit.
16. Macroeconomics: Definition and Subject matter - National Income: Concepts – GNP, GDP, NNP, Disposable income and Per capita income – Money: Definition, Types and functions of money - Inflation: Meaning and Types of inflation.
17. Public Finance: Meaning, Principles - Public Revenue: Meaning, Classification of taxes - Canons of taxation - Public expenditure: Principles – Welfare Economics: Meaning, Pareto’s optimality.

### **Practical Schedule**

1. Elucidation of 10 principles of economics.
2. Exercise on Law of Diminishing Marginal Utility - Exercise on Law of Equi-Marginal Utility.
3. Indifference Curve Analysis: Properties, budget line and consumer equilibrium.
4. Demand schedule - Graphical derivation of individual and market demand - Measurement of Arc and Point elasticities of demand.



5. Estimation of own price, income and cross price elasticities of demand - Estimation of consumer surplus.
6. Law of Diminishing Marginal Returns: Relationship among TPP, APP and MPP.
7. Cost concepts: Total cost, total fixed costs, total variable cost, average costs, marginal costs and Graphical derivation of cost curves - Estimation of total revenue and profit.
8. Supply: Estimation of supply elasticity - Estimation of producer surplus.
9. Market Structure – Characteristic features of different types of Sellers’ markets – Perfect competition, monopoly, oligopoly and monopolistic competition – Buyers’ Market – Price determination under Perfect completion and Monopoly.
10. Rent: Theories of Rent: Ricardian and Modern theories of rent - Wages: Determination of wages: Marginal productivity theory and Demand and supply theory of wages.
11. Interest: Theories of interest: Keynesian and Modern theories of interest – Profit: Risk - bearing theory of profit.
12. Approaches to computation of National Income - Analysis of Trends in National Income - Study of structural changes in the economy.
13. Estimation of Growth Rate of Population and Food grain production.
14. Money: Quantity theory of money – Inflation: Causes and control measures
15. Consumer price index and Wholesale price index - Estimation of price indices.
16. Measures of standard of living and human development – Human Development Index – Physical Quality of Life Index – Gender Development Index.
17. **Practical Examination.**

## References

1. Dewett, K. K. 2004. Modern Economic Theory, Syamlal Charitable Trust, New Delhi.
2. Mankiw, G.N., Principles of Microeconomics, Cengage Learning. Chapter 1.
3. Samuelson, P. 2004. Economics, (18/e), Tata Mc-graw-Hill, New Delhi
4. Seth, M. L. 2005. Principles of Economics, Lakshmi Narain Agarwal Co., Agra. New Delhi.

**THEORY**

Importance and history of sericulture – organizations involved in sericulture – silkworm types – Mulberry cultivation – varieties and management practices – pruning and harvesting – Pests, diseases and nematodes of mulberry and their management.

Mulberry silkworm – origin – classification based on voltinism, moultnism, geographical distribution and genetic nature – Pure races –multivoltine and bivoltine races – cross breeds – bivoltine hybrids – Morphology and biology of silkworm – mouth parts of larva – silkworm genetics – chromosome number in wild and domesticated species –sex limited characters – Anatomy and physiology of digestive and excretory systems of larva – structure and function of silk glands.

Rearing house – types – disinfection – room and bed disinfectants – Egg incubation methods – Chawki rearing – feeding, cleaning and spacing – Rearing of late age worms – feeding, cleaning, spacing and moulting care in different stages – spinning – Mountages – harvesting – Pests and diseases of silkworm and their management – Post cocoon technology – stifling to weaving – Non –mulberry silkworms – Eri, Tasar and Muga silkworms.

**PRACTICAL**

Morphology of mulberry plants – Identification of popular mulberry genotypes – Nursery bed and main field preparation – planting methods – Identification of nutrient deficiency symptoms – Identification of weeds – herbicide application method – pruning and harvesting methods – Identification of pests, diseases and nematodes of mulberry.

Morphology of silkworm – Identification of races – Dissection of mouth parts and silk glands – Disinfection techniques – rearing facilities – silkworm rearing – feeding, cleaning and spacing – Identification of pests and diseases of silkworm – hyperparasitoids and mass multiplication techniques – Visit to grainage, cocoon market, sericulture farms and silk reeling centre – Non-mulberry silkworms – Eri and Tasar silkworms – food plants – rearing methods.

## LECTURE SCHEDULE

### THEORY

1. Importance of sericulture – History of sericulture – silk road – Organizations in sericulture industry – Types of silkworm – Mulberry – origin – species – Morphology of mulberry plant – shoot system – importance of different morphological characters influencing leaf yield.
2. Ecological requirements for mulberry cultivation – soil type – mulberry varieties – Methods of propagation – merits and demerits – selection of semi hard wood cuttings – Nursery preparation – Main field preparation – methods of planting – pit, row, paired row and Kolar system of planting – merits and demerits.
3. Nutritional requirements – organic, inorganic and biofertilizers – Intercropping – Water management – Types of weeds and their management.
4. Pruning methods – bottom, middle, Kolar or strip system of pruning – Methods of harvesting – preservation of leaves.
5. Pests of mulberry – foliage feeders – sucking insects – subterranean insects – management of pests.
6. Diseases of mulberry – foliar diseases – soil borne pathogens – Nematodes - management of diseases and nematodes.
7. Mulberry silkworm – origin – classification based on voltinism, moultnism, geographical distribution and genetic nature – Characters of multivoltine races, bivoltine races, cross breeds and bivoltine hybrids – suitability for rearing in different seasons.
8. Morphology and biology of silkworm – sexual dimorphism in immature and adult Stages – silkworm genetics – chromosome number – sex limited characters in egg and larva.
- 9. Mid – Semester Examination**
10. Anatomy of digestive system – physiology of digestion and excretion – silk glands – silk synthesis – physico chemical properties of silk.
11. Rearing house – types – Hygienic rearing – Methods of disinfection – disinfectants – Egg transportation and incubation methods – black boxing.
12. Environmental requirements for different stages of silkworm – Chawki rearing – brushing – spacing – feeding cleaning – Selection of leaves for feeding – care during feeding, moulting, mounting and bed cleaning.

13. Rearing of late age worms – different methods – floor, shelf and shoot feeding – cleaning – spacing – mounting – Different mountages – merits and demerits – spinning – harvesting of cocoons.
14. Pests of silkworm – uzifly – dermestid beetle – management practices.
15. Diseases of silkworm – pebrine – flacherie – grasserie – muscardine – life cycle, pathological symptoms and management practices.
16. Post cocoon technology – selection of cocoons – methods of stifling – cooking for different races – Reeling devices – charka – cottage basin – multi end reeling machine – advantages – re reeling – twisting – degumming – dyeing – weaving - By product utilization.
17. Non – mulberry silkworm – Eri, Tasar and Muga Silkworms – food plants – rearing methods.

### **PRACTICAL**

1. Morphology of mulberry plant – description – leaf – types – distinguishing characters of promising mulberry genotypes.
2. Nursery bed preparation – care in selection of planning materials – Biofertilizer treatment in nursery – main field preparation – methods of planting.
3. Identification of nutrient deficiency symptoms – corrective measures – Identification of weeds – Herbicide application method.
4. Pruning methods – leaf harvest based on the larval instar – preservation of leaves.
5. Identification of different stages of pests of mulberry.
6. Identification of symptoms of diseases and nematodes of mulberry.
7. Morphology of silkworm – different stages – Identification of races by cocoon shape, colour and larval marking –Dissection of mouth parts and silk glands.
8. Rearing house and appliances – Methods of disinfection.
9. Incubation of eggs – methods – acid treatment of eggs – Chawki rearing – brushing – feeding.
10. Silkworm rearing – shelf and shoot rearing – skill involved in brushing – feeding-moulting care – bed cleaning – spacing — spinning and cocoon harvest.
11. Identification of pests and diseases of silkworm – Mass multiplication of hyperparasitoid.
12. Visit to grainage and cocoon market – observing the activities involved in selection of parent races – pairing – depairing - egg collection – cold storage – mother moth testing – fixing up of cocoon price – auction procedures.

13. Visit to silk reeling centre – observing various processes –stifling – cooking – reeling – rereeling – winding – rewinding – bleaching – dyeing – weaving – silk grades – Working out economics of raw silk production – Byproducts from reeling units.
14. Eri silkworm – morphology – food plants – methods of rearing – methods of spinning – methods of collection of cocoons – Tasar silkworm – morphology – food plants – early and late instar larval rearing.
15. Economic of silkworm rearing.
16. Visit to sericulture farms – Interaction with sericulturists.
17. Final Practical Examination.

**Assignment :**

1. Rearing of 50 larvae of cross breed silkworm from larva to cocoon by each student
2. Assignments on various aspects of Sericulture to twelve different group of students.

**REFERENCES**

- CSB. 2003. **Seri Business Manual- Vol. III Farm & Industry Sectors**, Central Silk Board, Bangalore.
- Dandin, S.B., J.Jayaswal and K. Giridhar.2003. **Hand book of Sericulture Technologies**. Central Silk Board, Bangalore, 287 p.
- David, B.V.and T.Kumaraswami. 1988. **Elements of Economic Entomology**, 4<sup>th</sup> Edition. Popular Book Depot, 536 p.
- Jolly, M.S., S.K. Sen, T.N. Sonwalkar and G.K. Prasad 1980. **Non – mulberry Silks**. FAO Agricultural Services Bulletin 29. Food and Agriculture Organisation of the United Nations, Rome,178 p.
- Krishnaswami,S., M.N. Narasimhanna, S.K Suryanarayan and S.Kumararaj. 1978. **Seiculture Manual 2 – Silkworm Rearing** . FAO Agricultural Services Bulletin 15/2. Food and Agriculture Organisation of the United Nations, Rome, 131 p.
- Krishnaswami, S., N.R.Madhava Rao, S.K.Suryanarayan and T.S.Sundaramurthy. 1972z . **Seiculture Manual 3 – Silk Reeling**. FAO Agricultural Services Bulletin 15/3. Food and Agriculture Organisation of the United Nations, Rome, 112 p.
- Rangaswami, G.,M.N.Narasimhanna, K.Kasiviswanathan, C.R.Sastry and M.S.Jolly. 1978. **Sericulture Manual 1 – Mulberry Cultivation**. FAO Agricultural Services Bulletin 15/1. Food and Agriculture Organization of the United Nations, Rome, 150 p.

**Unit I - Introduction to Environmental Science**

Environmental Science – Interrelationship with other sciences - Scope – Concepts - Segments - Global Environmental initiatives and perspectives – Environmental Sustainability – Ecological footprint

**Unit II - Ecology and Ecosystems**

Ecology – Relevance to man - Ecosystem - Components – Terrestrial - Biomes – Forest – Desert - Aquatic – Pond – River – Estuaries – Ocean - Matter cycling - Energy flow – Food Chain, Food Web and Ecological pyramids —Species interactions – Succession

**Unit III- Biodiversity and conservation**

Biodiversity – Types – National and Global Status – Significance – Hotspots - Threats – Conservation – *In-situ* – *Ex-situ* - Biosphere Reserve - National parks and Wildlife Sanctuaries – Botanical Garden

**Unit IV- Natural Resources**

Natural resources – Land – Water – Air – Forest – Minerals – Energy Resources – Renewable - Non-renewable - Status – Degradation – Sustainable Management and Conservations- Resource Extraction

**Unit V- Environmental problems and Protection**

Green House Gases-Global warming- Climate change-Impact on agriculture and other natural resources-Environmental pollution-Introduction to soil, water and air pollution -impact on agriculture and environment

Environmental protection-Global treaties - Conventions – National and state level organizations: TNPCB, CPCB — Environmental Laws and Acts – Environmental Education

**Practical Schedule:**

1. Environmental Sampling and preservation
2. Assessment of biodiversity in Natural ecosystem
3. Assessment of biodiversity in River ecosystem –
4. Assessment of biodiversity in Pond Ecosystem
5. Biodiversity assessment in different farming systems: organic farm
6. Biodiversity assessment in different farming systems: Conventional farm
7. Water quality analysis: pH, EC and TDS
8. Estimation of Acidity, Alkalinity and Hardness in the water sample
9. Estimation of DO, BOD of water sample
10. Enumeration of *E.coli* in water sample

11. Effect of wastewater irrigation on the germination of agricultural crops (Pot culture test for germination)
12. Estimation of Ammonical ,nitrate nitrogen and phosphorous
13. Estimation of Heavy metals using AAS
14. Assessment of Suspended Particulate Matter (SPM) in the atmosphere
15. Assessing the impact of Suspended Particulate Matter (SPM) on agricultural crops
16. Visit to Contaminated site and Common Effluent Treatment system
17. Practical examination

### **Lecture Schedule**

- 1) Introduction to Environmental Science, Interrelationship with other sciences, Scope, Concepts and Segments
- 2) Global Environmental initiatives and perspectives, Environmental Sustainability and Ecological footprint
- 3) Ecology, its Relevance to man, Ecosystem and its components
- 4) Biomes: Terrestrial (Forest, Desert, etc..) and Aquatic (Pond, River, Estuaries and Ocean)
- 5) Energy flow, Food Chain, Food Web and Ecological pyramids
- 6) Species interactions, adaptations and Succession
- 7) Biogeochemical cycles
- 8) Biodiversity: Types, National and Global Status, importance, Hotspots and Threats
- 9) Mid Semester Examination**
- 10) Conservation of Biodiversity: *In-situ and Ex-situ* - Biosphere Reserves - National parks, Wildlife Sanctuaries, Botanical Garden, etc..
- 11) Natural and Energy resources: Land, Water, Air, Forest, Minerals, Perpetual, Renewable and Non-renewable
- 12) Present Status of Natural and Energy resources, Resource Extraction, Degradation and Sustainable Management and Conservation.
- 13) Green House Gases-Global warming- Climate change-Impact on agriculture and other natural resources-
- 14) Environmental pollution-Introduction to soil, water and air pollution -impact on agriculture and environment
- 15) Global treaties and Conventions for Environmental Protection
- 16) National and state level organizations: CPCB, TNPCB, etc..
- 17) Environmental Education, Environmental Laws and Acts

**References:**

1. Tyler Miller and Scot Spoolman. 2009. Living in the Environment (*Concepts, Connections, and Solutions*). Brooks/cole,  
Cengage learning publication, Belmont, USA
2. P.D. Sharma, 2009, Ecology and Environment, Rastogi Publications, Meerat, India



**Aim**

To impart knowledge about the basic facts of Forestry as well as agroforestry and familiarize the students with important trees suitable for agroforestry and various agroforestry systems.

**Theory****Unit I –Introduction to Forestry**

Forest – Forestry – Definition, objectives, classification and historical perspectives in India. Role of forest – tangible and intangible benefits. Geographical distribution of world and Indian forests – Forest types – definition and major forest types of India - Forest cover of India as per Forest Survey of India - Definition of Silvics and Silviculture – objectives – its relation with other branches of forestry - International forestry organizations.

**Unit II Forests and people**

Social forestry – Definition, history, objectives – Components – Farm forestry, Extension forestry, Community forestry, Recreation forestry, Urban forestry – Benefits of social forestry - Important social forestry schemes implemented in India - Definition, origin and evolution of JFM in India – Salient features of JFM – Organisational structure in JFM- Benefit sharing mechanism

**Unit III – Agroforestry concept and systems**

Land use and land capability classification - Agroforestry – definition and scope – History of agroforestry – Components of agroforestry, benefits and limitations - Overview of global agroforestry - traditional agroforestry practices in Asia and India - Agroforestry system classification – structural, functional, ecological and socio-economic basis

**Unit IV – Agroforestry tree species and Mensuration**

Important farm grown trees - Silvicultural characters – Regeneration techniques – Tending – Rotation – Yield and Uses of *Tectona grandis*, *Santalum album*, Casuarina species, Eucalyptus species, *Azadirachta indica*, *Melia dubia*, *Leucaena leucocephala*, *Aibizia lebbek*, *Acacia nilotica*, *Acacia leucophloea*, *Acacia auriculiformis*, *Ailanthus excelsa*, *Dalbergia sissoo*, *Gmelina aroborea* and *Pterocarpus marsupium* - Forest Mensuration –

definition, objectives – Diameter, girth and height measurement methods–standard rules governing breast height measurement – Volume estimation in standing and felled trees

### **Unit V – Agroforestry practices**

Agroforestry practices for arid and semi arid regions – Agroforestry for problem soils - salt affected soils, waterlogged areas – Multifunctional agroforestry – green manure, fuel wood and fodder production – agroforestry for soil and water conservation, wasteland development – Carbon sequestration through agroforestry approaches – Timber transit rules for farm grown trees - National Agroforestry policy, 2014

### **Practical**

Identification of major farm grown tree species and study its uses – Nursery technology of *Tectona grandis*, *Casuarina* species, *Eucalyptus* species, *Azadirachta indica*, *Ailanthus ezcelsa*, *Melia dubia*, *Leucaena leucocephala*, *Aibizia lebbeck*, *Acacia nilotica*, *Acacia leucophloea*, *Dalbergia sissoo*, *Gmelina arborea*, *Santalum album* and *Pterocarpus marsupium* – Tree planting technique - Visit to agroforestry models – Agrisilviculture – Hortisilviculture - Silvipasture – Integrated Farming System - Windbreaks and shelterbelts – Industrial wood plantations and contract tree farming - Estimation of volume – Estimation of biomass – Economics of agroforestry.

### **Theory Lecture Schedule**

1. Forests and Forestry - Definition, objectives, classification and historical perspectives in India
2. Role of forests – Tangible and intangible benefits – Geographical distribution of world and Indian forests
3. Forest types – definition and major forest types of India – Forest cover of India – International Forestry organizations - Silvics and Silviculture – definition and objectives – relation with other branches of forestry
4. Definition, history and objectives of social forestry – Components and benefits of social forestry – Important social forestry schemes implemented in India
5. Joint Forest Management – definition, origin, evolution, salient features and organisational structure- benefit sharing mechanism
6. Land use capability classification -Agroforestry – definition, scope and history

7. Agroforestry components – benefits and limitations - Overview of global agroforestry – traditional agroforestry practices in Asia and India
8. Classification of agroforestry systems – structural, functional, ecological and socio-economic basis
9. Silvicultural characters, regeneration techniques, tending, rotation, yield and uses of teak, sandalwood and red sanders
10. Mid semester examination
11. Silvicultural characters, regeneration techniques, tending, rotation, yield and uses of Casuarina species, Eucalyptus species and *Ailanthus excelsa*
12. Silvicultural characters, regeneration techniques, tending, rotation, yield and uses of *Azadirachta indica*, *Melia dubia*, *Dalbergia sissoo* and *Gmelina arborea*
13. Definition, objectives, scope of Forest Mensuration - Diameter, girth and height measurement methods
14. Standard rules governing breast height measurement – volume estimation of standing and felled trees – measurement of weight and biomass
15. Agroforestry practices for arid, semi arid, salt affected and waterlogged soils
16. Agroforestry practices for fuelwood, fodder production, soil and water conservation and wasteland development - Carbon sequestration through agroforestry approaches
17. Timber transit rules for farm grown trees – National Agroforestry policy, 2014

### **Practical Schedule**

1. Identification of major farm grown tree species and study its uses
2. Nursery technology of Eucalyptus species and Casuarina species
3. Nursery technology of *Azadirachta indica* and *Melia dubia*
4. Nursery technology of *Ailanthus excelsa* and *Leucaena leucocephala*
5. Nursery technology of *Aibizia lebbeck*, *Acacia nilotica* and *Acacia leucophloea*
6. Nursery technology of *Dalbergia sissoo*, *Gmelina arborea* and *Santalum album*
7. Nursery technology of *Pterocarpus marsupium* and *Tectona grandis*
8. Visit to agrisilviculture and silvipasture model
9. Visit to Integrated Farming System
10. Designing an agroforestry model
11. Designing and establishment of wind break and shelter belt
12. Visit to pulpwood / plywood plantations
13. Studies on contract tree farming practices in Tamil Nadu

14. Estimation of volume of standing and felled trees
15. Estimation of tree biomass through various methods
16. Economics of agroforestry – Preparation of bankable projects
17. Final practical examination

### **Outcome / Deliverable**

The students will gain knowledge on concepts of forestry, agroforestry and the important agroforestry systems. The students will learn about the silviculture and nursery technology of important agroforestry tree species.

### **Text Books**

1. Divya, M.P., K.T.Parthiban, K.Srinivasan, K.Vanangamudi and M.Govinda Rao. 2008. A text book on Social Forestry and Agroforestry. Satish Publishers, Delhi
2. Dwivedi, A.P. 1992. Agroforestry Principles and Practices. oxford & IBH publishing Co., New Delhi
3. Khanna, L. S. 1991. Principles and Practice of Silviculture. Khanna Bandhu, Dehradun.
4. Chaturvedi, A. N and Khanna, L. S. 2000. Forest Mensuration. International Book Distributors, Dehradun.

### **Journals**

1. Agroforestry Systems, Netherlands
2. International Journal of Agroforestry and Silviculture, International Scholars Journals Publishing Corporation, USA
3. Indian Journal of Agroforestry, CAFRI, Jhansi
4. Agroforestry Today, ICRAF, Nairobi, Kenya
5. Range management and Agroforestry, IGFRI, Jhansi

### **E- resources**

- [www.worldagroforestry.org](http://www.worldagroforestry.org)
- [www.fao.org/forestry/9469/en](http://www.fao.org/forestry/9469/en)
- [www.global-saf.com](http://www.global-saf.com)
- [www.agroforestry.net.au](http://www.agroforestry.net.au)
- [www.nac.unl.edu/documents/insideagroforestry/vol16issue2.pdf](http://www.nac.unl.edu/documents/insideagroforestry/vol16issue2.pdf)

**Theory****Unit I: Principles of Food Science and Nutrition**

Food Science - definition – classification of foods – functional and nutritional classification. Food groups and food pyramid. Methods of cooking - moist, dry and microwave - principles, merits and demerits. Importance and scope of nutrition – relation of nutrition to health.

**Unit -II: Carbohydrate, Protein and Fat**

Carbohydrate – classification, functions, digestion and absorption, sources and Recommended Dietary allowance (RDA). Energy value of foods – determination. Protein – classification, functions digestion and absorption, sources and requirements. Protein quality of foods – supplementary value of protein. Fat - classification functions, digestion and absorption, sources and requirements. Rancidity – types of rancidity and prevention. Deficiency states of protein, carbohydrate and fat nutrition – signs and symptoms.

**Unit III: Vitamin and Mineral Nutrition**

Fat Soluble vitamins – A, D, E and K- functions, sources, requirements and deficiency. Water soluble vitamins – thiamine , riboflavin , niacin, pyridoxine, folic acid, cyanacobalamin, biotin, pantothenic acid ascorbic acid – functions, sources, deficiency and requirements. Minerals - calcium, iron, phosphorus, iodine, magnesium, zinc, sodium, potassium, fluorine and chlorine – functions, sources, deficiency and requirements. Importance of water – maintenance of electrolyte balance. Dietary fibre - importance, health benefits, sources and requirements.

**Unit IV: Food Preservation and Processing**

Introduction – preservation by sugar - processing of jam, squash, jelly, marmalade and beverages. Preservation by using salt, chemicals, dehydration technology, canning technology, preservation by low temperature and irradiation techniques. Processing of puffed, flaked and extruded products. Quality control of raw and processed products.

**Unit V: Food Quality and Safety**

Food packaging materials – requirements – methods – nutrition labeling. Food adulterants and their detection methods. Food laws and regulations and quality control standards - FSSAI, ISO, EU standards, FDA, HACCP and Codex Alimentarius Commission.

## **Practical**

Determination of energy value of Foods, cooking quality tests – cereals and pulses. Estimation of moisture, protein and fat. Processing of jam, jelly, squash, ready to serve beverages (RTS). Preparation of flaked, puffed and extruded products. Visit to food industries and quality control laboratory.

## **Theory Schedule**

1. Food Science – definition, scope and classification, food pyramid.
2. Methods, merits and demerits of moist heat, dry heat and microwave cooking of foods.
3. Importance and scope of nutrition and the relation of nutrition to health.
4. Carbohydrate – classification, functions, digestion and absorption, deficiency symptoms, sources and requirements.
5. Protein – classification, functions, digestion and absorption, deficiency symptoms, sources and requirements. Protein quality – supplementary value of protein.
6. Fat - classification, functions, digestion and absorption, deficiency symptoms, sources and requirements. Rancidity – types. Determination of energy value of foods.
7. Fat soluble vitamins – A, D, E and K – functions, deficiency symptoms, sources and requirements.
8. Water soluble vitamins - thiamine, riboflavin, niacin, pyridoxine, folic acid, cyanacobalamin, biotin, pantothenic acid, ascorbic acid – functions, deficiency symptoms, sources and requirements.

## **9. Mid Semester Examination**

10. Minerals – calcium, iron, phosphorus, iodine, magnesium, zinc, sodium, potassium, fluorine and chlorine – functions, sources, requirements and deficiency diseases.
11. Importance of water and maintenance of electrolyte balance. Health benefits of fibre.
12. Preservation of food by low and high temperature and food irradiation.
13. Processing of puffed, flaked and extruded products
14. Preservation by using sugar (jam, jelly, squash and marmalade), preservation by using salt (brining and pickling) and use of preservatives in food preservation.
15. Food packaging – importance, types of packaging materials and nutrition labeling.
16. Common food adulterants and their detection.
17. Food laws and regulations and quality control standards - FSSAI, ISO, EU standards, FDA, HACCP and Codex Alimentarius Commission.

## **Practical Schedule**

1. Cooking tests for cereals and pulses
2. Determination of energy value of food
3. Estimation of moisture
4. Estimation of protein
5. Estimation of fat
6. Estimation of ascorbic acid
7. Estimation of iron
8. Estimation of crude fibre
9. Processing of jam and jelly
10. Processing of squash and RTS
11. Puffing of pulses
12. Extrusion of cereals and millets
13. Canning of fruits and vegetables
14. Processing of dehydrated fruits and vegetables
15. Identification of common food adulterants
16. Visit to food processing unit and quality control lab
17. Final Practical Examination

## **TEXT BOOKS**

1. Srilakshmi, B. 2005. Food Science. New Age International (P) Ltd., Publishers, New Delhi.
2. Srivastava, R.P., and Sanjeevkumar. S. 2013. Fruit and Vegetable preservation. International Book Distributing Co. Lucknow.
3. Srilakshmi .B. 2015. Nutrition Science. New Age International Pvt. Ltd. New Delhi.

## **JOURNALS**

1. The Indian Journal of Nutrition and Dietetics
2. Journal of Food Science and Technology
3. Critical Reviews of Food Science and Nutrition

## **WEB RESOURCES**

1. [www.cellinteractive.com](http://www.cellinteractive.com)
2. [www.nutrition.org.uk](http://www.nutrition.org.uk)
3. [www.fnic.nal.usda.gov](http://www.fnic.nal.usda.gov)
4. [www.myfooddiary.com](http://www.myfooddiary.com)

(Alternate courses for non-Tamil students)

**Aim:**

- Basic principles of learning
- Taxonomy of educational
- Career development and entrepreneurship
- Communication skills

**Lecture Schedule**

1. Basic principles of learning. Binary terms viz – growth and development, education – for – life and life – long education, motivation and morale –
2. Occupation and profession, training and education, lateral thinking and convergent thinking, teaching and learning – discussion.
3. Bloom’s classification of educational objectives – Cognitive, Affective, Psychomotor domain(s)
4. Career development – opportunity for graduates of agriculture and allied sciences – discussion
5. Success story of a farmer / entrepreneur – factors involved – role – play
6. Brainstorming – Demonstration
7. Simulation – Educational Simulation-Interactive Teaching - Business Simulation – Company’s annual report for analysis
8. Interpersonal communication – Transactional communication – ice breaker
- 9. MID SEMESTER EXAMINATION**
10. The conduct of a symposium
11. Conferencing – the concept and presentation of a paper
12. Scientific Article Writing and Editing
13. Popular Article Writing, Editing and Blogging
14. Project proposal
15. Project Report – writing
16. Entrepreneur – intrapreneur – Managing an intrapreneur – motivation and entrepreneurship development – planning, monitoring and evaluation.
- 17. FINAL PRACTICAL EXAMINATION**

**Text book:**

Sudarsanam.R 1985. “Development Education” Chapter 1,2

**Outcome:**

- Understand the concepts of learning,
- The necessity for Lifelong education,
- Communication skills in terms of career development



## References

1. Bloom, B.S., Hastings J.T. and Maduas J.F. 1971. Handbook on Formative and Summative Evaluation of Student Learning Mc Graw Hill Pub, New York.
2. Day, A Robert 1993. "How to Write and Publish a Scientific Paper" CUP.
3. Hariharan.S. 1995. "Brainstorming and Interactive Learning" Research Quarterly, ADU, Coimbatore.
4. Krishna Mohan and Meera Banerji, 1990. "Developing Communication Skills", Macmillan Pub. Co., Ch.6,9,10,13 and 15.
5. Mathew.M. Monipally. 1997. "The craft of Business Letter Writing". Tata McGraw Hill Pup., Ch. 10 & Appendix – I.
6. Seely John. 1988. "Communicating in Everyday Life". The Oxford Guide to Writing and Speaking, OUP. P.1-79.
7. Sudarsanam.R 1985. "Development Education" Chapter 1,2.
8. Taneja.R.P. 1991. Dictionary of Education, Anmol Pub., New Delhi, India.
9. Wallace, L.Michael 1998. "Study Skills in English" CUP Unit.4.

## TAM 101 தமிழ் இலக்கியங்களில் வேளாண்மையும்

### அறிவியல் தமிழ்ப் பயன்பாடும் (0+1)

தொல்காப்பியம் காட்டும் முதற்பொருள், கருப்பொருள் - சங்க இலக்கியத்தில் வேளாண் தொழில் நுட்பங்கள் - பதினெண் கீழ்க்கணக்கு நூல்களில் வேளாண்மை அறிவியல் - பள்ளு இலக்கியங்கள், ஏரெழுபது, இலக்கியத்தில் வேளாண் பொறியியல் - தோட்டவியல் - வனவியல் மனையியல் - சூழலியல் வேளாண்மைப் பழமொழிகள் - இலக்கியம் காட்டும் வாழ்வியல் நெறிமுறைகள் - இக்கால இலக்கியங்களில் வேளாண்மைச் சிந்தனைகள் - பிழையின்றி எழுதும் முறைகள் - இலக்கியத்தில் மென்திறன்கள் - அறிவியல் தமிழ் வளர்ச்சி நிலைகள் கலைச்சொல்லாக்கம் - மொழி பெயர்ப்பாளர் - ஆட்சித் தமிழ் - உழவர்களுக்கான அறிவிப்புகளை வெளியிடுதல் - கட்டுரைச் சுருக்கம் எழுதுதல் - கணினி உலகில் தமிழ்

### செய்முறைப் பயிற்சிகள்

1. தொல்காப்பியம் காட்டும் முதற்பொருள், கருப்பொருள் வழி வேளாண் மரபுகளை அறிதல்
2. சங்க இலக்கியத்தில் வேளாண் தொழில் நுட்பங்கள் - (எட்டுத்தொகை, பத்துப்பாட்டு)
3. பதினெண் கீழ்க்கணக்கு நூல்களில் வேளாண்மை அறிவியல்
4. பள்ளு இலக்கியங்கள், ஏரெழுபது - உழவர் வாழ்வியல் நெறிமுறைகளும் வேளாண்மைத் தொழில் நுட்பங்களும்
5. இலக்கியத்தில் வேளாண் பொறியியல் - தோட்டவியல் - வனவியல் - மனையியல் - சூழலியல்
6. வேளாண்மைப் பழமொழிகள் - உழவு விதை அறிவியல் - நாற்று நடுதல் - எரு இடுதல் - நீர்ப்பாசனம் - களை மேலாண்மை - பயிர்பாதுகாப்பு - அறுவடை - உழவர் சமுதாயம்
7. இலக்கியம் காட்டும் வாழ்வியல் நெறிமுறைகள்
8. இக்கால இலக்கியங்களில் வேளாண்மைச் சிந்தனைகள் - பாரதி, பாரதிதாசன் படைப்புகள் - புதுக்கவிதை - சிறுகதை - புதினம்
9. இடைநிலைப் பருவத்தேர்வு
10. பிழையின்றி எழுதும் முறைகள் - எழுத்துப் பிழைகள் - சொற்பிழைகள் - சொற் பிரிப்புப்பிழை - வாக்கியப்பிழை - மெய்ப்புத் திருத்தம்
11. இலக்கியத்தில் மென்திறன்கள் - தலைமைப்பண்பு - கால மேலாண்மை
12. ஆளுமைப்பண்பு மேம்பாடு - மனித உறவுத்திறன்கள் வளர்த்தல்
13. அறிவியல் தமிழ் வளர்ச்சி நிலைகள், வேளாண் நூல்கள், வேளாண் இதழ்கள்
14. கலைச்சொல்லாக்கம் - வேளாண் கலைச் சொற்களை உருவாக்கும் முறை - தரப்படுத்துதல் - இலக்கிய வேளாண் கலைச்சொற்கள், வட்டார வேளாண்மை வழக்குச் சொற்கள் - அகராதியியல்
15. மொழி பெயர்ப்பு - முக்கிய விதிகள் - படிநிலைகள் - மொழி பெயர்ப்பாளரின் இன்றியமையாப் பண்புகள் - வேளாண் செய்திகளை மொழி பெயர்த்தல்

16. ஆட்சித் தமிழ் - அரசாணைகள் அலுவலக் கடிதங்கள் - உழவர்களுக்கான அறிவிப்புக்களை வெளியிடுதல் - கட்டுரைச் சுருக்கம் எழுதுதல்
17. கணினி உலகில் தமிழ் - ஒருங்கு குறியீடு பயிற்றுவித்தல் - வலைப் பூக்கள் - விகிப்பீடியா – வேளாண் செய்திகளைப் பதிவேற்றம் செய்தல் - வேளாண் செய்திகளை இணையதள வழி அறிதல்

#### மேற்பார்வை நூல்கள்

- கந்தசாமி.இல.செ.வேளாண்மையும் பண்பாடும், தமிழ்நாடு வேளாண்மைப் பல்கலைக்கழகம், கோயம்புத்தூர், 1974
- கந்தசாமி. இல.செ.இலக்கியத்தில் வேளாண்மை, தமிழ்நாடு வேளாண்மைப்பல்கலைக்கழகம், கோயம்புத்தூர் 1981.
- கந்தசாமி. இல.செ. வேளாண்மை பழமொழிகள், கலைச்செல்வம் பதிப்பகம், கோயம்புத்தூர் 1983.
- குழந்தைசாமி.வா.செ.அறிவியல் தமிழ், பாரதி பதிப்பகம், சென்னை
- மீனாட்சி சுந்தரம். மா. மற்றும் ஏ.இல.விசயலட்சுமி தகவல் தொடர்பில் தமிழ் மொழிப்பயன்பாடு, கே.ஆர்.எ.ஆப்செட் பிரிண்டர், கோவை – 2002
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- இலக்கியமும் வேளாண்மையும், அனைத்திந்திய அறிவியல் தமிழ்க் கழகம், தஞ்சாவூர், 2006
- தமிழரின் மரபுச்செல்வங்கள், உலகத் தமிழராய்ச்சி நிறுவனம், சென்னை
- சந்திரசேகரன், இரா, மொழிப்பாடம் - படைப்பாக்கத்திறன் வளர்த்தல்
- வேளாண்கலைச்சொல் பேரகராதி, தமிழ் நாடு வேளாண்மைப் பல்கலைக்கழகம், கோயம்புத்தூர், 2008.
- பாவேந்தன், இரா, தமிழில் அறிவியல் இதழ்கள், சாமுவேல், .பிஷ் கிறின் பதிப்பகம், கோயம்புத்தூர்
- டாக்டர் இராதா செல்லப்பன், கலைச்சொல்லாக்கம், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்

**I Year**

Orientation – NSS origin – motto – symbol – NSS administration at different levels – programme planning – Rural Projects – Urban projects – Government schemes – Career guidance – Self help groups – Environment protection – Use of natural energy – Conventional energy resources – Soil and Water conservation – Community health programmes – Women and child welfare – Education for all – National days – Commemorative days – NSS thematic programmes – literacy & computer awareness campaigns.

**II Year**

Popularization of agro techniques – Self employment opportunities – Animal health, Dairy and Poultry farming – Road safety – Training on First aid and emergency cell. Popularization of small savings – communal harmony and National integration – Care of Senior citizens – Personality development – meditation, Yoga Art of living – Activities on the preservation of National monuments, cultural heritage and folklore – special camp activities – National days – commemorative days – NSS thematic programmes – literacy & computer awareness campaigns.

**Practical Schedule****I Semester**

- 1 Orientation of NSS volunteers and programme coordinator and Programme officers.
2. Origin of NSS in India and its development
3. NSS motto, symbol and NSS awards
4. Organizational set up of NSS at Central, State University and college levels.
5. Programme planning – Theme of the year – planning implementation at PC, PO and NSS volunteer level.
6. Visit to selected village - gathering basic data on socio economic status.
7. Participatory rural appraisal – studying the needs of the target group.
8. Visit of urban slum and gathering data on socio economic status.

9. Self involvement and methods of creating rapport with the target group.
10. Awareness campaign on welfare schemes of the central and state government.
11. Formation career guidance group with NSS volunteers and students welfare unit
12. Cycle rally on environmental protection.
13. Campus development activities – clean environment campaign, formation of plastic free zones.
- 14 – 16: Campus development, tree planting maintenance and greening the campus cleaning.
17. **Final Examination.**

## **II Semester**

- 1–3: Motivation of rural and urban youth for formation of SHG (Self Help Groups) in collaboration with Government machineries and NGOs.
4. Campaign on ill effects of plastics in the adjoining campus areas – Villages / urban areas.
5. Campaign on *Parthenium* eradication.
6. Cycle rally on air pollution – Vehicle exhaust and other means.
7. Popularization of biogas and smokeless chulah.
8. Demonstration on the use of wind energy and solar energy.
9. Demonstration of water harvesting techniques.
10. Demonstration on soil conservation techniques wherever possible.
11. Campaign on Community health programmes of central and state Government – involving Health department officials.
12. AIDS awareness campaign ; campaign on diabetes and healthy food habits and drug abuse
13. Planning formation of blood donors club – involving NGOs.
14. Campaign on gender equality and women empowerment.
15. Campaign on child health care – immunization, food habits and child labour abolition.

## **III Semester**

1. Conducting field days with KVK to popularize improved agro techniques.
2. Conducing seminar / workshop in a nearby village to motivate the youth on agribusiness (involving DEE, KVK, NGO and local agro-entrepreneurs).
- 3–5 Campaign on self employment opportunities like Apiculture, mushroom cultivation, Food processing and value addition, production of biocontrol agents and biofertilizers,

nursery techniques, seed production, tissue culture, vermicompost, manufacture of small gadgets and agricultural implements as per local needs and feasibility.

6. Animal health care campaign – Dairy and poultry farming - Forage production techniques and silage making.
7. Training the NSS volunteers on road safety measures in involving traffic wardens and RTO.
8. Training NSS volunteers on First AID and emergency call involving NGOs and organizations like St. John's Ambulance, Red Cross, etc.,
9. Organizing road safety rally.
10. Motivating NSS Volunteers on small savings concept and conveying the message to the public through them.
12. Observation of National integration and communal harmony.
- 14 – 16 : Campus development and greening activities
17. **Final Examination.**

#### **IV Semester**

- 1 – 3 : Visit to orphanages and old age homes to look after their needs.
4. Personality development programmes – Building up self confidence in youth.
- 5 – 7: Teaching NSS volunteers on mediation Yoga and art of healthy living with trained teachers
- 8 – 9 : Visit of nearby National Monument / Places of tourist importance and campaign on cleanliness and preservation.
- 10–11 : Exploration of hidden talents of village youth and public on folklore, traditional art, sports, martial arts and cultural heritage.
- 12–13. Campus improvement activities
- 14–16 : Visit to special camp village and pre camp planning.
17. **Final Examination.**

- Besides the above, NSS volunteers will attend work during important occasions like Convocation, Farmers day, Sports meet and other University / College functions.
- NSS Volunteers will attend one special camp in the selected village for a duration of 10 days and undertake various activities based on the need of that village.
- For all out door regular activities villages / slums nearby the campus may be selected to avoid transport cost (cycle able distance)

- Special camp activity will be conducted in a village situated within a radius of 15 – 20 KM.

## EVALUATION

### A. Regular activities

<b>60 marks</b>	=	I Semester	15 marks
		II Semester	15 marks
		III Semester	15 marks
		IV Semester	15 marks

(Written test 10 marks – participation in programmes and behavior-5 marks) 80% attendance is mandatory for attending special camp

### B. Special camp activities

a. Attendance in daily activities during special camp	:	30 marks
b. Special camp activity report	:	5 marks
c. <i>Viva - voce</i> on the 10 <sup>th</sup> day of the special camp	:	5 marks

<b>Total</b>	:	<b>40 marks</b>
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**I Year**

General - Military History – Introduction to NCC – Aims of NCC – Principles of NCC, NCC organization, Duties of good citizen – system of NCC training – Foot drill – Arms drill – Guard of Honour – Ceremonial Drill – Weapon training – First aid – Rifle and Light machine gun – Map reading – Civil defence – Leadership.

**II Year**

Drill – Weapon drill – Weapon training and firing – Introduction to National Integration – Historical – geographical – Religions back ground of India – Health and Sanitation – Aid to Civil Authorities – Civil defence – Ecology / Nature awareness – Map reading – Social service – Adventure Activities – Leadership qualities.

**I Semester**

1. NCC song – Aims and Motto of NCC – Motivation of cadets
2. History of NCC and organization of NCC
3. Foot drill – General and word of Command
4. Human Resource Development – Motivation – Duties of Good citizen
5. National Integration – Indian History and Culture
6. Health and Hygiene – Structure and Function of a human body, hygiene and Sanitation
7. Social Service – weaker sections of our society and their needs
8. Self Defence – Theory and practice, prevention of untoward incidence
9. Map reading – introduction to map, and lay out of map
10. Disaster Management Civil defence organization and its duties
11. Communication – Different types – media
12. Signals – introduction to radio, telephony procedures
13. Field Engineering – principles and applications, camouflage and concealment
14. Adventure training introduction, different types
15. First Aid – methods and practices
16. Environment and Ecology – conservation



## 17. **Final Examination.**

### **II Semester**

1. Drill – Weapon drill – Word of Commands
2. National integration- unity in diversity
3. Guard of Honour and Ceremonial drill
4. Types of weapon, Parts, Stripping and Assembling of light gun.
5. Rifle firing and follow up activities
6. Camps, types of Camps, Preparation and participation
7. Awards, different types, Ranks of officers and Cadets
8. Map reading – judging distance, conventional signs and uses of compass.
9. Leadership traits, types, perception
10. Fire Fighting, Role of NCC during natural hazards
11. Field Engineering – section formation
12. Obstacle training
13. Health and Sanitation – preventable diseases, Fractures and types of treatments
14. Environment and Ecology-Pollution and its control.
15. Social Service – contribution of youth towards social welfare
16. First Aid – Snake bite and other common medical Emergencies.
17. **Final Examination.**

### **III Semester**

1. Drill – Individual word of command
2. Weapon training – parts of heavy weapons
3. Stripping and assembling of heavy weapons
4. Importance of team work values, code of ethics
5. Disaster management during Earth Quake
6. Evacuation of Casualties
7. Map reading – Camposs and Service Protractor
8. Aids to civil authority
9. Section and platoon formation
10. Social service, NGO's and their contribution to the society
11. Roll of NCC cadets in civil administration
12. Traffic rules and Road signs

13. Mines and types of mine fields
14. Dressing of Wounds, physical and mental health
15. Field signals
16. Air raid warning, Fire fighting
17. **Final Examination.**

#### **IV Semester**

1. Drill – Foot drill
2. Formation of squad and squad drill
3. Man Management, Morale
4. Time Management, stress management
5. Ecology and Environment wild life conservation
6. Adventure Activities, Trekking Camp
7. Map reading – Field to Map – Map to Field – Grids and scale systems
8. Communication systems – Internet – Faxi mail – Satellites
9. Collection and Distribution of Aid material
10. Field Engineering – Mines, anti tanks, explosives
11. Opportunities for NCC cadets in Army and other services
12. Social Service, Family Planning
13. Section battle drill
14. Roll of NCC cadets in National programmes.
15. Visit to Wellington, Coonoor.
16. Self defence mechanisms
17. **Final examination.**

Besides the above schedule, NCC cadets will be involved during important occasions during convocation, Independence day, Republic day, etc.

#### **EVALUATION:**

		<b>Sem I</b>	<b>Sem II</b>	<b>Sem III</b>	<b>Sem IV</b>	<b>Total</b>
A.	Regular activities and Behaviour	10	10	10	10	40
B.	Participation in camps and special assignments	5	5	5	5	20
C.	Written test and viva	10	10	10	10	40

	<b>Total</b>	<b>25</b>	<b>25</b>	<b>25</b>	<b>25</b>	<b>100</b>
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**PED 101**

**Physical Education**

**0+1**

**Practical**

(17 Practical classes – 2½ hours each class – 17 classes will be converted into 40 practical hours and 2½ hours for evaluation)

**I Semester (20 Hours)**

Exercises for strength, agility, co-ordination, flexibility, co-operation, vital capacity endurance, speed and for various systems of our body and team spirit.

Exercise for Good Posture – Conditioning and calisthenics for various Athletic activities *i.e* (a) Before start – Arm stretch, hand stretch and cat stretch (b) Loosening up jogging, bending and twisting (c) Standing – Lateral Arc, triangle and hands to feet pose (d) Sitting – camel kneel, spinal twist and supine knee bend (e) Relaxation – The corpse pose, quick and deep relaxation. Basic gymnastic exercises – participation of athletic events – running, throwing and jumping events.

**Skill development in any one of the following games**

Warming up, suitable exercise, lead up games, advance skill for all the games.

**Basket Ball** : Dribbling, pass, two or three men pass, pivot, lay up shot, shooting, pass break, hook pass, screening, positional play, defence and offence tactics.

**Volley Ball** : Fingering, under arm pass, over head pass, setting, spiking, back pass, jump pass, stunts, elementary dive, flaying dive, roll, blocking and various types of services.

**Ball Badminton** : Grip, service, foot work, fore hand stroke, back hand stroke, lob, smash, volley, wall practice, spin service and defence tactics.

**Foot ball** : Dribbling, passing, dodging, kicking, heading, screening, chest pass, throwing, dragging, goal kick, defence and offence tactics.

**Hockey** : Grip, bully, dribbling, hitting, drive, push strokes, scoop, flick, stopping, various types of passes, dodging, defence and offence tactics.

**Kho-Kho** : Quadra ped, bi-ped, how to given kho, taking a direction, recede, parallel toe method, bullet tow method, distal method, foot out, dive, ring game, chains and persue and defence skills.

**Chess** : Moves, move of king, move of pawns, move of rooks, move of bishops, move of queen, move of knights, en passant, castling, check and notation.

**Kabaddi** : Raid, touch, cant, catch, struggle, various types of defence and offence tactics.

**Cricket** : Grip, bowling, spin, leg spin, off spin, medium, batting, dive, sweep, mode of delivery, fielding, rolling etc.

**Tennis** : Grip, forehand drive, back hand drive, stroke, backhand ground stroke, service, volley, smash, wall practice, foot work, defence and offence tactics.

**Table Tennis** : Grip, tossing and serving, spin serve, rally, smash, flick, defence and offence tactics.

**Shuttle Badminton** : Grip, foot work, service, setting, smash, volley, forehand and back hand stroke, back hand serve and defence.

**Gymnastics** : Balanced walk, execution, floor exercise, tumbling/acrobatics, grip, release, swinging, parallel bar exercise, horizontal bar exercise, flic-flac-walk and pyramids.

## **ATHLETICS**

(a) **Sprint** : Medium start, long start, bunch start, set, pick up, finish, upsweep, downsweep, placement, receiving and exchanging.

(b) **Jumps** : Western roll, belly roll, eastern cut off, fass ferry flop, approach, take off, straddle, hitch-kick, handging, clearance, landing, strides etc.

(c) **Throws** : Grip, momentum, pre shift, sub phase, the wind up, foot work, entry to the turn, shift, angle of release, follow throw, delivery, front cross step, rear cross step, hop step, fuck method pary obraine, discoput, rotation, carry and glide.

(d) **Hurdles** : Finding lead leg, use of lead leg and trial leg, flight, clearing, finish.

Lead up games, advance skills and game for any one of the above games.

## **II Semester (20+ 2 ½ hours)**

Rules and regulations of anyone of the games and athletic events.

Aims and objectiaves of yoga – asanas : ie. padmasana, pujankasana, sarvangasana, chakrasana,dhanurasana, halasana, mayurasana and savasana, asanas for ailments, back pain, arthritis, abdominal problems, stress, fatiguel, Insomnia, obsity, circulation, hypertension, varicose veins, respiration, heart, digenstion, headaches, depression, addiction and eye problems.

Mental balance and importance – development of concentration suriyanamaskar – advance skills of any one of the games which were taught in the I semester.

### **METHOD OF EVALUATION:**

a. Attendance	60 Marks
b. Behavior	10 Marks
c. Participation in Sports and Games	20 Marks
d. Final <i>Viva Voce</i>	10 Marks

Marks will be awarded at the end of the IV Semester based on the above method of evaluation procedure. Final class grade chart of each student will be sent to the Dean of concerned colleges of Tamil Nadu Agricultural University.

## **PED 102 - YOGA FOR HUMAN EXCELLENCE (0+1)**

### **Optional course (Two semesters)**

#### **Semester - II**

#### **UNIT - 1: SCIENCE OF ENERGY AND CONSCIOUSNESS**

Who am I? - Energy and Consciousness - Absolute space - Characteristics and capabilities of Absolute space – Magnetism - Universal magnetism and Bio magnetism - Transformation of Universe and Living beings – Sixth sense of human being Genetic centre and functions - Purification of genetic centre imprints in living bodies - Differences in men - Karma Yoga - Cause and Effect system – Duty Consciousness – Love and compassion – Service to humanity - Management techniques - Effective Examination Preparation - Yogasanas for keeping up good health - SKY Yoga types of meditation Part 2: Absolute Space meditation - Five perception centres meditation – Five elements and solar family meditation.

#### **UNIT - 2: YOGA PRACTICES – II**

SKY Yoga meditations Part 2: Absolute Space meditation - Five perception centres meditation – Five elements and solar family meditation - Thought analysis – Moralization of desire – Neutralization of anger- Eradication of worries - Personality development practice - Healthy Body Postures: Salutation to Nature - Asanas: - Thadasana – Ekapathasana – Chakrasana (sideways) – Thirikonasana - Thandasana – Vajrasana – Padmasana - Januseerasana – Pachimothasana – Ustrasana - Bhujangasana – Salabasana – Makkarasana - Artha Pavana Mukthasana – Pavana Mukthasana – Uddhana Padasana – Navasana – Savasana.

Chin mudra – Vayu mudra – Sunya mudra – Prithivi mudra – Varuna mudra – Prana mudra – Apana mudra – Apana vayu mudra – Adhi mudra.

**Practical Schedule  
Semester II**

Class	Topic
1	Who am I? – Crown centre meditation- (Thuriyam) - Simplified Physical Exercises Full exercises
2	Energy and Consciousness - Absolute space - Genetic centre meditation Practice - Salutation to Nature
3	Characteristics and capabilities of Absolute space – Magnetism - Absolute Space meditation - Simplified Physical Exercises - Asanas: - Thadasana – Ekapathasana – Chakrasana (sideways) – Thirikonasana
4	Five perception centres meditation - Five perception centres meditation explanation - Thandasana – Vajrasana – Padmasana - Januseerasana – Pachimothasana – Ustrasana - Kayakalpa
5	Five elements and solar family meditation - Five elements and solar family meditation explanation - Salutation to Nature Bhujangasana – Salabasana – Makkarasana - Kayakalpa
6	Universal magnetism and Bio magnetism (Transformation of Universe and Living beings) - Crown centre meditation- (Thuriyam) - Artha Pavana Mukthasana – Pavana Mukthasana – Uddhana Padasana – Navasana – Savasana - Kayakalpa
7	Sixth sense of human being - Genetic centre meditation Practice - Chin mudra – Vayu mudra – Sunya mudra – Prithivi mudra – Varuna mudra – Prana mudra – Apana mudra – Apana vayu mudra – Adhi mudra - Kayakalpa
8	Genetic centre and functions - Purification of genetic centre imprints in living bodies - Absolute Space meditation - Salutation to Nature - Kayakalpa
9	Differences in men - Five perception centres meditation - Simplified Physical Exercises Full exercises - Kayakalpa
10	Karma Yoga – Duty Consciousness - Five elements and solar family meditation - Asanas: - Thadasana – Ekapathasana – Chakrasana (sideways) – Thirikonasana - Thandasana – Vajrasana – Padmasana - Januseerasana – Pachimothasana – Ustrasana - Kayakalpa
11	Cause and Effect system - Crown centre meditation- (Thuriyam) - Bhujangasana – Salabasana – Makkarasana - Kayakalpa
12	Love and compassion - Genetic centre meditation Practice - Artha Pavana Mukthasana – Pavana Mukthasana – Uddhana Padasana – Navasana – Savasana - Kayakalpa

13	Management techniques – (Stress – Emotional – Self – Conflict) - Absolute Space meditation - Salutation to Nature - Kayakalpa
14	Management techniques – (Self identity - Self Monitoring - Group dynamics - Team Management) - Five perception centres meditation - Simplified Physical Exercises Full exercises – Kayakalpa
15	Effective Examination Preparation - Five elements and solar family meditation - Salutation to Nature - Kayakalpa
16	Effective Examination Preparation - Crown centre meditation- (Thuriyam) - Simplified Physical Exercises Full exercises - Kayakalpa
17	Final practical Examination

**Outcome :** The course will improve the memory power, concentration in education, improvement of health of the body and mind. Hence the students will excel in their career.

## Semester - II

### Reference books:

- 1) Yoga for modern age - Thathuvagnani Vethathiri Maharishi
- 2) Journey of Consciousness - Thomas Fitzgerald
- 3) Unified force - Thathuvagnani Vethathiri Maharishi
- 4) The History of Universe and living beings - Thathuvagnani Vethathiri Maharishi
- 5) 'The theory of Existence & the Science of Consciousness' - Steven S. Stadler. amazon.com
- 6) Simplified Physical Exercises - Thathuvagnani Vethathiri Maharishi
- 7) Kayakalpam - Thathuvagnani Vethathiri Maharishi
- 8) Sound Health through Yoga - Dr.K. Chandrasekaran,  
Prem Kalyana Publications, Sedapatti
- 9) Light on Yoga - BKS. Iyenger, HarperCollins Publishers,  
New Delhi.
- 10) Yoga for Youth Empowerment - VISION for Wisdom