B. Sc. (Hons) Agriculture

Semester wise Course Summary

Sem	Core courses	Common Courses	Remedial Courses	Non-gradial Courses	Elective Courses	RAWE	ELP	Total
I	17	--	3/5	3	--	--	--	23
II	19	2	--	3	--	--	--	24
III	19	5	--	--	--	--	--	24
IV	21	--	--	1	3	--	--	25
V	19	2	--	--	3	--	--	24
VI	20	--	--	--	3	--	--	23
VII	--	--	--	--	--	20	--	20
VIII	--	--	--	--	--	--	20	20
Total	**115**	**9**	**3/5**	**7**	**9**	**20**	**20**	**183/ 185**

B. Sc. (Hons) Agriculture
Semester wise Course Lay Out (Proposed)

Semester-I

Course No.	Courses	Credit		
		T	P	Total
A)	**Core courses**			
AGRO 111	Fundamentals of Agronomy-I	1	1	2
AGRO 112	Introductory Agro-meteorology and Climate change	1	1	2
AHDS 111	Livestock Production & Management	1	1	2
EXTN 111	Rural Sociology & Educational Psychology	2	0	2
HORT 111	Fundamentals of Horticulture	1	1	2
LANG 111	Comprehension & Communication Skills in English	1	1	2
MIBO 111	Introductory Microbiology	1	1	2
SSAC 111	Fundamentals of Soil Science	2	1	3
	Total Core Courses	**10**	**7**	**17**
B)	**Remedial Courses (3 or 5 credit)**			0
AGH 111	Agricultural Heritage[*1]	1	0	1
BIO 111	Introductory biology [*2]	1	1	2
MATH 111	Elementary Mathematics [*3]	2	0	2
	Sub total	**3/4**	**0/1**	**3/5**
C)	**Non-Gradial Courses (4 credits)**			0
HVE 111	Human Values & Ethics	1	0	1
NCC 111/ NSS 111	NCC/ NSS **	0	1	1
PHEY 111	Physical Education and Yoga	0	1	1
	Sub total	**1**	**2**	**3**
	Total Credits (A+B+C)	**14/15**	**9/10**	**23/25**

*** Remedial Courses (3/5 credit)** **** Non-Gradial Courses (3 Credits)**

*[1]Compulsory to all students

*[2] Students who have Biology in XII std are exempted

*[3]Students who have MATH in XII std are exempted

** NCC or NSS

Course :	AGRO 111		Credit:	2(1+1)	Semester-I
Course title:	Fundamentals of Agronomy-I				

Syllabus

Theory: Agronomy, its scope and relationship with other sciences, Tillage and tilth, Seeds and sowing. Crop density and geometry, Crop nutrition, Manures and fertilizers.Nutrient use efficiency.Growth and development of crops.Plant ideotypes.Crop rotation and its principles.Study of crop adaptation and its distribution.Harvesting, threshing and Storage of field crops. Weeds - characteristics and classification. Crop - weed competition. Concept of weed management. Herbicides – Classification, selectivity and resistance of herbicide, allelopathic effect of weed.

Practical: Identification of seeds and crop plants at different growth stages. Study of different tillage implements Identification of fertilizers and pesticides. Identification of weed flora in different field crops.Agro climatic zones of Maharashtra and India Operational tillage viz., primary, secondary, inter-tillage. Sowing, harvesting, harvesting implements and working with them. Calculation of Plant Population, Seed rate, fertilizer and herbicide dose for different field crops. Methods of seed germination and viability test. Practice of seed treatments in different field crops. Computation of weed indices Application of manures and fertilizer in important field crops.Application of herbicides in different field crops. Yield contributing characters and yield estimation in different field crops.

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)
1	Agronomy, its definition, scope, role of Agronomist and relationship of Agronomy with other sciences.	4
2	Tillage, its definition, objects of tillage, types of tillage, tillage implements and factors affecting tillage, Effect of tillage on soil and crop growth.	8
3	Tilth: its definition, characteristics and ideal tilth, Modern concepts of tillage, minimum, zero and stubble mulch tillage, importance of puddling.	6
4	Seed, its definition, characteristics of quality seed, seed treatment and its objectives seed dormancy, causes of seed dormancy and multiplication, stages of seed.	8
5	Methods of sowing seed and sowing implements.	4
6	Effect of plant population on growth and yield, Planting geometry viz., solid, paired and skipped row planting	6
7	Role of plant nutrients in crop production, Importance of manures and fertilizers and its classification.	6

8	Methods and time of application of manures, fertilizers and green manuring.	6
9	Nutrient use efficiency, meaning and factors affecting nutrient use efficiency.	6
10	Growth and development, its definition, growth curve and factors affecting growth and development.	6
11	Plant ideotypes, its definition and types of ideotypes.	6
12	Crop rotation, its definition, principles and advantages of crop rotation.	6
13	Study of crop adaptation and its distribution	4
14	Weeds, its definition, characteristics of weeds, merits and demerits of weeds, classification of weeds, meaning of crop weed competition and its period in different crops.	6
15	Principles and methods of weed management viz., cultural, mechanical, chemical, biological weed control methods and integrated weed management.	6
16	Classification of herbicides, its selectivity and resistance, Allelopathic effect of weed.	6
17	Crop harvesting, signs of maturity in different field crops, Physiological and crop maturity, Methods of threshing crops, Cleaning, Drying and Storage of field crops.	6

b) Practical

Experiment	**Topic**
1	Identification of seeds and crop plants at different growth stages.
2	Identification of different tillage implements.
3	Identification of fertilizers and pesticides.
4	Identification of weed flora in different field crops.
5	Study of agro climatic zones of Maharashtra and India.
6 & 7	Operational tillage viz., primary, secondary,, inter-tillage, sowing, harvesting, harvesting implements, Working with them.
8 & 9	Calculation of Plant Population, Seed rate, fertilizer and herbicide dose for different field crops.
10	Determination of purity and germination percentage of seed, Methods of seed germination.
11	Study of viability test and practice of seed treatments in different field crops.
12	Preparation methods of FYM and compost. (Delet) Computation of weed indices
13	Preparation methods of vermicompost and green manuring. (Delet)
14 & 15	Study of different methods of manures and fertilizer application and their application practice in important field crops.

16	Methods of application of herbicides in different field crops.
17	Study of yield contributing characters and yield estimation in different field crops.

Suggested Readings:

1) Chhidda Singh, Modern techniques of raising field corps. Oxford and IBH Publishing Co. Ltd., Bangalore.
2) Gopal Chandra De. 1980., Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore.
3) Hand book of Agriculture, ICAR Publication.
4) Palaniappan, S.P., Cropping Systems in the tropics – Principles and Practices.Willey Eastern Ltd., New Delhi.
5) Panda, S.C., 2006.Agronomy Agribios Publication, New Delhi.
6) Reddy, S.R. Principles of Agronomy Kalyani Publishers, Ludhiana, India.
7) Sankaran, S and SubbiahMudliyar, V.T., 1991. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
8) Vaidya, V.G., Sahasrabuddhe, K.R. andKhuspe, V.S. Crop production and field experimentation. Continental Prakashan, Vijaynagar, Pune.
9) Rao V.S. (2006), Principles of Weed Science. Oxford and IBH Publishing Co., New Delhi, India.
10) Gupta, O.P. (2008), Modern Weed Management Agribios India Publication.

Course :	*AGRO 112*		***Credit:***	*2(1+1)*	***Semester-I***
Course title:	*Introductory Agro-meteorology and Climate change*				

Syllabus

Theory: Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon-mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-

wave.Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical : Visit of Agro-meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and long wave radiation, and its estimation using Planck's intensity law.Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS.Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.Measurement of soil temperature and computation of soil heat flux.Determination of vapor pressure and relative humidity.Determination of dew point temperature.Measurement of atmospheric pressure and analysis of atmospheric conditions.Measurement of wind speed and wind direction, preparation of windrose.Measurement, tabulation and analysis of rain.Measurement of open pan evaporation and evapotranspiration.Computation of PET and AET.

Teaching Schedule/ Lesson plan

a) Theory

Lecture	**Topic**	**Weightage (%)**
1	Meaning and scope of agricultural meteorology	4
2	Earth's atmosphere - its composition, extent and structure ; Atmospheric weather variables	9
3	Atmospheric pressure – its variation with height	2
4	Wind-types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze	8
5	Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo	8
6	Atmospheric temperature - temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth	8
7	Atmospheric humidity - concept of saturation, vapour pressure, process of condensation, formation of dew, fog, mist, frost, cloud	8
8	Precipitation –process of precipitation, types of precipitation such as rain, snow, sleet and hail	8
9	Cloud formation and classification	6
10	Artificial rainmaking ; Monsoon mechanism and importance in Indian agriculture	4
11	Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold wave	8
12	Agriculture and weather relations	5
13	Modifications of crop microclimate	4

14	Climatic normals for crop and livestock production	4
15	Weather forecasting - types of weather forecast and their uses	4
16	Climate change , climatic variability, global warming , causes of climate change and its impact on regional and national Agriculture	10

b) Practical

Experiment	**Topic**
1	Visit of Agrometeorological Observatory.
2	Site selection of observatory, exposure of instruments and weather data recording.
3	Measurement of air temperatures, its tabulation and variation.
4	Measurement of soil temperature.
5	Measurement of rainfall.
6 & 7	Measurement of wind speed and wind direction.
8 & 9	Measurement of evaporation with the help of open pan evaporation.
10	Measurement of evapotranspiration.
11	Measurement of sunshine duration using Campbell Stokes sunshine recorder.
12	Measurement of solar radiation.
13	Measurement of Atmospheric pressure.
14	Measurement of Relative Humidity with the help of Assmann'spsychrometer
15	Determination of Vapour pressure, RH and dew point temperature using hygrometric table
16	Preparation of Synoptic charts.
17	Study of Automatic Weather Station

Suggested Readings

1) Agricultural Meteorology- G.S.L.H.V. Prasad Rao, Kerala Agricultural University Publications.
2) Text book of Agricultural Meteorology – M. C. Varshneya and P. BalkrishnaPillai.
3) Introduction to Agro-meteorology- H. S. Mavi
4) Our Atmosphere- SmitaBhutani
5) Atmosphere, weather and climate – Barry R. G. and Charley R. J. The English

Language Book Society and Mathuen and Co. Ltd., Sultolk.

6) Climate, weather and crops in India – D. Lenka.
7) Meteorology – S. R. Ghadekar

Course :	*HORT 111*		***Credit:***	*2(1+1)*	***Semester-I***
Course title:	*Fundamentals of Horticulture*				

Syllabus

Theory

Horticulture-Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops; Plant propagation-methods and propagating structures; principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; kitchen gardening; garden types and parts; lawn making; medicinal and aromatic plants; species and condiments; use of plant bio-regulators in horticulture. Irrigation & fertilizers application-method and quantity.

Practical

Identification of garden tools.Identification of horticultural crops.Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation. Layout and planting of orchard plants.Training and pruning of fruit trees.Transplanting and care of vegetable seedlings.Making of herbaceous and shrubbery borders.Preparation of potting mixture, potting and repotting.Fertilizer application in different crops.Visits to commercial nurseries/orchard.

Teaching Schedule

a) Theory

Lecture	**Topics**	**Weightage (%)**
1	Horticulture-Its definition and branches, importance and scope	10
2	Horticultural and botanical classification	05
3	Climate and soil for horticultural crops	10
4	Plant propagation-methods and propagating structures	10
5	Principles of orchard establishment	05
6	Principles and methods of training and pruning, juvenility and flower bud differentiation	10

7	Unfruitfulness	10
8	Pollination, pollinizers and pollinators	
9	Fertilization and parthenocarpy	
10	Kitchen gardening	10
11	Garden types and parts;	
12	Lawn making;	05
13	Medicinal and aromatic plants;	05
14	Spices and condiments;	05
15	Use of plant bio-regulators in horticulture	05
16	Irrigation & fertilizers application-method and quantity	10
	Total	**100**

b) Practical

Experiment	**Topics**
1	Identification of garden tools
2	Identification of horticultural crops
3	Identification of horticultural crops
4	Preparation of seed bed/nursery bed
5	Practice of sexual method of propagation
6	Practice of asexual methods of propagation – Cutting & Layering
7	Practice of asexual methods of propagation – Budding
8	Practice of asexual methods of propagation – Grafting
9	Layout and planting of orchard plants
10	Training and pruning of fruit trees
11	Transplanting and care of vegetable seedlings
12	Making of herbaceous and shrubbery borders
13	Preparation of potting mixture, potting and repotting
14	Fertilizer application in different crops
15	Visits to commercial nurseries
16	Visits to commercial orchard

Suggested Readings:

Sr. No	**Title of Book**	**Authors**
1	Fruit Culture in India	Sham Singh and others
2	Handbook of Horticulture	ICAR Publication
3	Principles of Horticulture and fruit growing	Kunte and Yawalkar
4	Production Technology of Fruit Crops	Shanmugvelu, K.G.

Course :	*EXTN 111*		***Credit:***	*2(2+0)*	***Semester-I***
Course title:	*Rural Sociology & Educational Psychology*				

Syllabus

Theory

- **Sociology :**Meaning, definition
- **Rural Sociology** : Meaning, definition, scope, importance of Rural Sociology in agricultural extension and interrelationship between Rural Sociology and Agricultural Extension.
- **Indian Rural Society :** Important characteristics, differences between rural and urban societies.
- **Social Groups :** Meaning, definition, classification, factors considered in formation and organization of groups, and role of social groups in agricultural extension
- **Social Stratification** : Meaning, definition, functions, Basis for stratification, forms of social stratification, Characteristics and differences between class and caste system
- **Cultural Concepts** : Culture, customs, folkways, mores, taboos, rituals and traditions – Meaning, definition and their role in agricultural extension.
- **Social Values and Attitudes :** Meaning, definition, types and role of social values and attitudes in agricultural extension.
- **Social Institutions :**Meaning, definition, major institutions in rural society : Marriage, family, and religion, functions and their role in agricultural extension.
- **Social Control :** Meaning, definition, need of social control and means of social control.
- **Social Change :** Meaning, definition, nature of social change, dimensions of social change and factors of social change.
- **Leader :** Meaning, definition, types and their role in agricultural extension.
- **Psychology and Educational Psychology :** Meaning, definition, scope and importance of educational psychology in agricultural extension.
- **Behavior:** Cognitive, affective, psychomotor domain
- **Intelligence :** Meaning, definition, types, factors affecting intelligence.
- **Personality :** Meaning, definition, types, factors influencing personality.
- **Teaching-Learning Process :** Meaning and definition of teaching, learning, Learning experience and learning situation, elements of learning situation and its characteristics, Principles of learning and their implication for teaching.
- **Perception:** Meaning, definition, role of perception in agricultural extension
- **Motivation :**Meaning, definition, role of motivation in agricultural extension

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)

1	Sociology :Meaning, definition	5
2, 3	Rural Sociology : Meaning, definition, scope, importance of Rural Sociology in agricultural extension and interrelationship between Rural Sociology and Agricultural Extension.	5
6, 7	Indian Rural Society : Important characteristics, differences between rural and urban societies.	10
8, 9	Social Groups : Meaning, definition, classification, factors considered in formation and organization of groups, and role of social groups in agricultural extension	5
10, 11	Social Stratification : Meaning, definition, functions, Basis for stratification, forms of social stratification, Characteristics and differences between class and caste system	5
12, 13	Cultural Concepts : Culture, customs, folkways, mores, taboos, rituals and traditions – Meaning, definition and their role in agricultural extension.	5
14, 15	Social Values and Attitudes : Meaning, definition, types and role of social values and attitudes in agricultural extension.	5
16, 17	Social Institutions :Meaning, definition, major institutions in rural society : Marriage, family, and religion, functions and their role in agricultural extension.	5
18, 19	Social Control : Meaning, definition, need of social control and means of social control.	5
20, 21	Social Change : Meaning, definition, nature of social change, dimensions of social change and factors of social change.	5
22	Leader : Meaning, definition, types and their role in agricultural extension	5
23	Psychology and Educational Psychology : Meaning, definition, scope and importance of educational psychology in agricultural extension.	5
24	Behavior: Cognitive, affective, psychomotor domain	5
25, 26	Intelligence : Meaning, definition, types, factors affecting intelligence.	5
27, 28	Personality : Meaning, definition, types, factors influencing personality.	5

29, 30	Teaching-Learning Process : Meaning and definition of teaching, learning, Learning experience and learning situation, elements of learning situation and its characteristics, Principles of learning and their implication for teaching.	10
31	Perception: Meaning, definition, role of perception in agricultural extension	5
32	Motivation : Meaning, definition, role of motivation in agricultural extension	5
	Total	**100**

Suggested Reading

1) *Ray, G.L. (2003), Extension Communication and Management. Kalyani Publishers. Fifth revised and enlarged edition.*
2) Dahama, O.P. and Bhatnagar, O.P. (2003). Education and Communication for Development. Oxford and IBH Publishing Co. Pvt. Ltd.
3) Sandhu, A.S. (1993) Textbook on Agricultural Communication: Process and Methods. Oxford and IBH Publishing Co. Pvt. Ltd.
4) Chitambar, J.B. (2008). Introductory Rural Sociology. New Age International (P) Limited.
5) Sachdeva, D. R. and Bhushan, V (2007). An Introduction to Sociology. KitabMahal Agency.
6) *Chitambar, J.B. (1973). Introductory rural sociology. New York, John Wilex and Sons.*
7) *Desai, A.R. (1978). Rural sociology in India. Bombay, Popular Prakashan, 5th Rev. ed.*
8) *Doshi, S.L. (2007). Rural sociology. Delhi Rawat Publishers.*
9) *Jayapalan, N. (2002). Rural sociology. New Delhi, Altanic Publishers.*
10) *Sharma, K.L. (1997). Rural society in India. Delhi, Rawat Publishers.*

Course :	*MIBO 111*		***Credit:***	*2(1+1)*	***Semester-I***
Course title:	*Introductory Microbiology*				

Syllabus

Theory

Introduction.Microbial world: History of Agril. Microbiology, Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy,

growth. Bacterial nutrition: classification of nutrients Macroelements, Microelements, growth factors, culture media, nutritional classification of microorganisms Bacterial genetics: Genetic recombination- transformation, conjugation and transduction, plasmids, transposon.

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and asymbiotic.Azolla, blue green algae and mycorrhiza.Rhizosphere and phyllosphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.**Mushrooms- edible and poisonous types, nutritive values, Culturing and production techniques.**

Practical

Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture.Methods of sterilization.Nutritional media and their preparations.Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.Methods of isolation and purification of microbial cultures.Isolation of *Rhizobium* from legume root nodule.Isolation of *Azotobacter* from soil.Isolation of *Azospirillum* from roots.Isolation of BGA.Staining and microscopic examination of microbes.Simple Staining, Negative staining and Gram Staining. Isolation of P and silicon Solubilizing Microbes, Mycorrhiza, Isolation of cellulose and Pectin degrading microbes for agro waste management

Teaching Schedule

a) Theory

Lecture	**Topic**	**Weightages (%)**
1	Microbiology: Introduction,Scope in Agriculture and allied fields.	5
2	History of Agricultural Microbiology, development of Microbiology. Development of Microscope	5
3	Microbial World: Prokaryotic and eukaryotic microorganisms.	6
4	Bacteria: cell structure, morphology, cytology and other characters, functions of external and internal parts.	6
5	Bacteria: Nutrients required for growth of bacteria, chemoautotrophy, photo autotrophy, Microbial growth	6
6	Bacterial genetics: Genetic recombination- Gene transfer by transformation, conjugation and transduction, Plasmids,	8
7	Role of microbes in soil fertility and crop production. Microbial transformation of Nitrogen, Biological nitrogen fixation- symbiotic, asymbiotic and associative ,Azolla, blue green algae.	8
8	Microbial transformation of phosphorus, sulphur and carbon, decomposition of organic matter	11

9	Mycorrhiza: structure, types, merits, demerits	5
10	Rhizosphere and Phylloshere: Rhizosphere concept, microbes of Rhizosphere,Phylloshere: Phylospheric microflora	6
11	Silage production, single cell protein, Bio-fuel production-concept	8
12	Biofertilizers: definition, types of biofertilizers,	6
13	Bio-pesticides-Microbial insecticides	4
14	Biodegradation of agro-waste	5
15	Mushrooms- edible and poisonous, culturing and production	6
16	Microbes in human welfare:	5
	Total	**100**

b) Practical

Experiment	**Topic**
1	Acquaintance with microscope and other lab equipments
2	Methods of sterilization
3	Nutritional media and their preparations.
4	Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.
5	Methods of isolation and purification of microbial cultures.
6	Isolation of *Rhizobium* from legume root nodule.
7	Isolation of *Azotobacter* from soil.
8	Isolation of *Azospirillum* from roots.
9	Isolation of BGA
10	Simple staining of bacteria
11	Gram staining of bacteria
12	Isolation of P and silicon Solubilizing Microbes
13	Isolation of Potash solubilisingMicrobes
14	Isolation of Mycorrhiza
15	Isolation of cellulolytic microbes for agro waste management
16	Isolation of Pectin degrading microbes for agro waste management

Suggested Readings

1. *M T Madigan, and J M Martinko, 2014. Biology of Microorganisms 14th Edn.*
2. *Pearson.M J Pelczer, 1998. Microbiology 5th Edn. Tata McGrow Hill Education Pvt. Ltd.*
3. *Strainer, R, 1987. General Microbiology. Palgrave Macmillan.Edward Alchano, 2002.*

   Introduction to Microbiology.Jones and Bartlett hearing.
4. *R P Singh, 2007. General Microbiology. Kalyani Publishers.*
5. *J Heritage, E G V Evans, R A Killington, 2008. Introductory Microbiology. Cambridge*

University press P. date.

6. *Pelczar, jr. M.J.E.C.S.Chan and Krieg, N.R. 1996. Microbiology. Mc Graw Hill Publishers,*

   Newyork.

7. *Prescott, L.M. Harley, J.P. and Klein, D.A (5ed) 2002. Microbiology. Mc Graw Hill*

   Publishers, Newyork.

8. *Jamaluddin, M. Malvidya, N. and Sharma, A. 2006. General Microbiology. Scientific*

   Publishers, Washington.

9. *Sullia, S.B, and Shantaram 1998. General Microbiology. Oxford and IBH.*

10. *Borkar,S,G, and Patil N.M. 2016.Mushroom,A nutritive food and its cultivation. Astral*

    International Pvt.Ltd,New Delhi

11. *Borkar,S.G. 2015.Beneficial Microbes as Biofertilizers and its Production Technology*

    Woodhead Publisher,I ndia,New Delhi

12. *Madigan, M. Martinkoj, M. and Parker (10 ed.) 2003. Biology of Microorganisms. Prentice Hall of India Pvt. Ltd., New Delhi.*

Course :	*SSAC 111*		***Credit:***	*3(2+1)*	***Semester-I***
Course title:	*Fundamentals of Soil Science*				

Syllabus

Theory

Soil as a natural body,pedological and edaphological concepts of soil. Soil genesis: soil forming rocks and minerals. Weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro organisms, their

beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

Study of soil profile in field.Study of soil sampling tools, collection of representative soil sample, its processing and storage.Study of soil forming rocks and minerals.Determination of soil density, moisture content and porosity.Determination of soil texture by feel and Bouyoucos Methods.Studies of capillary rise phenomenon of water in soil column and water movement in soil.Determination of soil pH and electrical conductivity.Determination of cation exchange capacity of soil.Study of soil map.Determination of soil colour.Demonstration of heat transfer in soil.Estimation of organic matter content of soil.

Teaching schedule

a) Theory

Lecture	**Topic**	**Weightage (%)**
1 & 2	History and development of soil science, its scope and importance. Soil as natural body, pedological and edapholgical concept of soil.	5
3 & 4	Soil genesis: Soil forming rocks and minerals.	6
5 & 6	Weathering of Rocks and Minerals.	6
7 & 8	Processes and factors of soils formation.	5
9	Soil profile, components of soil.	5
10 & 11	Soil physical properties:Soil texture, structure, density and porosity.	5
12	Soil colour, consistency and plasticity.	3
13 ,14	Elementary knowledge of soil survey, soil taxonomy, classification, Land capability classification.	5
15	Soils of India and Maharashtra.	3
16 , 17&18	Soil water : Soil water classification, soil water retention , soil water potential, soil moisture constants', Hydraulic conductivity, permeability, percolation, movement and availability in soil.	6
19	Soil air : composition, gaseous exchangeand effect on plant growth.	6
20	Soil temperature: source,amount and flow of heat in soil and effect on plant growth.	6
21 &22	Soil reaction: pH, soil acidity and alkalinity, buffering capacity, effect of soil pH on nutrient availability.	6
23 & 24	Soil colloids: soil colloidal properties, inorganic and organic colloids.	4
25 , 26 & 27	Silicate clay: constituents and properties, sources of charge, ion exchange, cation and anion exchange capacity, base saturation.	6
28,29 & 30	Soil organic matter: sources, composition, properties, factors affecting SOM, its importance and influence on soil properties.	6

31	Humic substances-nature and properties	5
32 ,33 &34	Soil organisms : macro and micro organism, their beneficial and harmful effects on soil and plant. soil biological properties (SMBC, soil respiration, DHA etc.)	6
35 & 36	Soil pollution – sources of soil pollution*, behavior of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.	6
	Total	**100**

b) Practical

Experiment	**Topic**
1	Study of soil forming minerals.
2	Study of soil forming rocks.
3	Study of soil sampling tools, collection of representative soil sample, its processing and storage.
4	Determination of moisture content in soil by gravimetric method.
5	Determination of soil colour by Munsell soil colour chart in field.
6	Determination of bulk density (Clod coating method) and particle density by pycnometer and porosity of soil.
7	Determination of soil texture by feel method.
8	Determination of soil texture by Bouyoucos hydrometer method.
9	Demonstration of capillary rise phenomenon of water in soil column.
10	Determination of infiltration rate of soil by double ring infiltrometer.
11	Determination of hydraulic conductivity of soil by constant head method.
12	Determination of soil temperature by using soil thermometer (0-15 and 15-30cm).
13	Determination of soil pH and electrical conductivity of soil.
14	Determination of anion exchange capacity of soil.
15	Determination of cation exchange capacity of soil (By NH_4OAc Method).
15	Study of soil map.
16	Estimation of organic carbon and organic matter content in soil by Walkely and Black method.

17 &18	Study of soil profile in field.

Suggested Reading

1) *ISSS. 2009. Fundamentals of Soil Science. 2nd Ed. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.*

Das D. K. 2011. Introductory Soil Science, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.

1) *Brady, N. C. 2016. The Nature and Properties of Soils. 15th edition Publisher: Pearson Education, ISBN: 978-0133254488*

Daji J A; Daji J A; Kadam J R; Patil N D.1996. Textbook of Soil Science Bombay Media Promoters and publishers Pvt. Ltd.

1) **Biswas, T.D.; Mukherjee, S.K..** 1995. Text Book of Soil Science 2nd sEd.Tata McGraw Hill Publisher, Delhi pp 433.
2) *6. Somawanshi, et al. 2012. Laboratory Methods for Analysis of Soil, Irrigation Water and Plants.., Department of Soil Science and Agriculturasl Chemistry, MPKV., Rahuri. revised Ed. pp. 307.*
3) *Jakson, M.L. 1973. Soil Chemical Analysis. Printice Hall, India, Pvt. Ltd. New Delhi. pp 498.*
4)
5) *Page et. al. 1982. Methods of Soil Analysis, Part 1 and 2. Chemical and Microbiological Properties . 2nd Ed. Soil Science Soc. of America Am. Soc. Agron., Madison, Wisconsin, USA.*
6) *Klute, A. 1986. Methods of Chemical Analysis, 2nd Ed. American Soc. Agron.,Inc. and Soil Science Society of America. Madison, Wisconsin, USA.*
7) *Piper, C. S. 1966. Soil and Plant Analysis. Inters Science . Hans Publisher, Mumbai.*
8) *Black, C. A. 1965. Soil Chemical Analysis, Part I and part II. American Soc. Agron.,Inc. and Soil Science Society of America. Madison, Wisconsin, USA.*

Hesse, P. R. 1971. a Text Book of Soil Chemical Analysis. John Murray, London.

1)
2) *Richards, L. A. 1968. Diagnosis and Improvement sof Saline Alkali Soils. Oxford andIBH Publication Co. Calcutta.*

Chora, S. L. and Kanwar, J. S. 1991. Analytical Agricultural Chemistry, Kalyani Publisher New Delhi.

1) Chapman, *H.D., and P.F.* Pratt. 1961. *Methods of analysis for soils, plants and waters. Division of Agricultural Sciences, University of California,*
2) *Mehara , R. K. 2004. Text Book of Soil Science., ICAR, New Delhi.*
3) *Patil, V. D. and Mali C. V. 2007. Fundamentals of Soil Science, Aman Publication, Meerut.*
4) *NirankariLal Singh. 2000. Text Book of Soil Science. Aman Publication, Meerut.*
5) *Tandon H.L.S. 1994. Recycling of Waste in Agriculture. Fertilizer Development t and consultation organization.*

Course :	*AHDS 111*		***Credit:***	*2(1+1)*	***Semester-I***
Course title:	*Livestock Production & Management*				

Syllabus

Theory

Importance of livestock in the national economy. Livestock development programmes of Govt. of India. Terminology used in livestock management. Important exotic and Indian breeds of cattle and buffalo.Male and female reproductive system of cattle.Measures and factors affecting fertility in livestock, Reproductive behaviour – oestrus and parturition.Mammary gland and milk secretion.Feeding and management of calves, heifers, dry, pregnant, milch animals and breeding bull. Disease – causes, symptoms, preventive and control measures. Feeding and production records. Organic livestock production- definition, importance, principles, standards, certifications, SWOT analysis. Concept of A 1 and A 2 milk.Effect of climate change on livestock production.Integrated livestock farming. Cost of milk production, economical unit of cattle and buffalo.

Practical

External body parts of cattle and buffalo. Routine management practices followed on livestock farm. Methods of handling and restraining of animal.Methods of identification marks and dehorning of animal.Recording of pulse rate, respiration rate and body temperature of animal.Preparation of feeding schedule and feeding different categories of cattle and buffalo.Estimation of age and body weight of animal. Clean and hygienic milk productionand milking methods. Judging of animal for dairy and draft purpose.Study of computerized database on dairy farm.Vaccination and control of ecto and endo parasites in cattle and buffalo.Study of various dairy structures.Collection of semen and artificial insemination in farm animal.Pregnancy diagnosis in farm animal.Utilization of dairy farm wastes i. e. dung, urine, etc.Preparation of viable bank proposal for cattle and buffalo.

Teaching Schedule

a) Theory

Lecture	Topic	Weightage (%)
1	Importance of Livestock in the national economy and different livestock development programme	10
2	Livestock census and trends of livestock production	5
3	Terminology used in livestock management	5
4 & 5	Important Indian and exotic breeds of cattle and buffalo	7

6	Principles of maximization of livestock production	6
7	Feeding and management of calf, heifer and milking animal	5
8	Feeding and management of dry, pregnant, draft animals and breeding bull	10
9	Diseases and it's preventive, curative measures in cattle and buffalo	6
10	Bovine male and female reproductive system	7
11	Fertility, sterility and reproductive behaviour viz. oestrus and parturition	7
12	Mammary gland and milk secretion	7
13	Organic livestock production- definition, importance, principles, standards, certifications, SWOT analysis, A 1 and A 2 milk	8
14	Effect of climate change on livestock production	5
15	Integrated livestock farming	7
16	Cost of milk production, economical unit of cattle and buffalo	5
	Total	**100**

b) Practical

1) *External body parts of cattle and buffalo*
2) *Routine management practices followed on livestock farm*
3) *Methods of handling and restraining of animal*
4) *Methods of identification marks and dehorning of animal*
5) *Recording of pulse rate, respiration rate and body temperature of animal*
6) *Preparation of feeding schedule and feeding different categories of cattle and buffalo*
7) *Estimation of age and body weight of animal*
8) *Clean and hygienic milk production and milking methods*
9) *Judging of animal for dairy and draft purpose*
10) *Study of computerized database on dairy farm*
11) *Vaccination and control of ecto and endo parasites in cattle and buffalo*
12) *Study of various dairy structures*
13) *Collection of semen and artificial insemination and pregnancy diagnosis in farm animal*
14) *Utilization of dairy farm wastes i. e. dung, urine, etc.*
15) *Preparation of viable bank proposal for cattle and buffalo*
16) *Visit to dairy farms*

Suggested Readings

1) *Livestock and paultry Production – Harban Singh and Moore, E. N. (1968)*
2) *Goat, Sheep and Pig Production and Management – Jagdish Prasad, (1996), Kalyani Publishers 1/1, Rajinder Nagar, Ludhiana*
3) *Text Book of Animal Husbandry – G. C. Banergee (1999), 9th ed Oxford and IBH*

Publishers, New Delhi.
4) *Dairy Bovine Production – Thomas, C. K. and Sastri, N. S. R., Kalyani Publishers,1/1, Rajinder Nagar, Ludhiana.*
5) *Text-Book of Buffalo Production – Ranjhan, S. K. and Pathak, N. N. (1979) Vikas, Publishing House Pvt. Ltd. 576, Masjid Road, Jangpura, New Delhi.*

Course :	*LANG 111*		***Credit:***	*2(1+1)*	***Semester-I***
Course title:	*Comprehension & Communication Skills in English*				

Syllabus

Theory

The following Lessons from the textbook—***Current English for Colleges*** (by N Krishnaswamy and T. Sriraman; Macmillan; 2007 Rs. 95/-)—are for the theory classes along with the Exercises at the end of each lesson.

1. *Education 2. Employment 3. Unemployment 4. Application 5. Planning 6. Curriculum Vitae 7. Interview 8. Reporting 9. General Knowledge 10. Stress 11. Short Story 12. Environment 13. Computerecy 14. A Dilemma 15. Entertainment 16. You and Your English 17. Usage and Abusage 18. War Minus Shooting*

Practical

Vocabulary- Antonym, Synonym, Homophones, Homonyms; Functional grammar: Articles, Prepositions; Verb, Subject-Verb Agreement; Written Skills: Paragraph writing, Precis writing; The Style: Importance of professional writing; Preparation of Curriculum Vitae and Job applications; Interviews: kinds, Importance and process; Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Stress and Intonation, Conversation practice. Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions

Teaching Schedule

a) Theory

Lecture	**Topic**	**Weightage (%)**
1	Education	5
2	Employment	5
3	Unemployment	5
4	Application	5
5	Planning	5
6	Curriculum Vitae	5

7	Interview	5
8	Reporting	5
9	General Knowledge	5
10	Stress	5
11	Short Story	10
12	Environment	10
13	Computeracy	5
14	A Dilemma	5
15	Entertainment	8
16	You and Your English	8
17	Usage and Abusage	2
18	War Minus Shooting	2
	Total	**100**

b) Practical

Exercise	**Topic**	**Weightage (%)**
1	Education	5
2	Employment	5
3	Unemployment	5
4	Application	5
5	Planning	5
6	Curriculum Vitae	5
7	Interview	5
8	Reporting	5
9	General Knowledge	5
10	Stress	5
11	Short Story	10
12	Environment	10
13	Computeracy	5
14	A Dilemma	5
15	Entertainment	8
16	You and Your English	8
17	Usage and Abusage	2
18	War Minus Shooting	2
	Total	**100**

Suggested Readings:

1) *Krishnaswamy,. N and Sriraman, T. 1995. Current English for Colleges. Macmillan India Ltd. Madras.*
2) *Balasubrmanyam M. 1985. Business Communication. Vani Educational Books, New Delhi.*

3) *Naterop, Jean, B. and Rod Revell. 1997. Telephoning in English. Cambridge University Press, Cambridge.*

4) *Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd. New Delhi.*

5) *Narayanaswamy V R. 1979. Strengthen your writing. Orient Longman, New Delhi.*

6) *Sharma R C and Krishna Mohan. 1978. Business Correspondence. Tata McGraw Hill Publishing Company, New Delhi.*

7) *Carnegie, Dale. 2012. How to Win Friends and Influence People in the Digital Age. Simon & Schuster.*

8) *Covey Stephen R. 1989. TheSeven Habits of Highly Successful People. Free Press.*

9) *Spitzberg B, Barge K &Morreale, Sherwyn P. 2006. Human Communication: Motivation, Knowledge & Skills.Wadsworth.*

10) *Verma, KC. 2013. The Art of Communication. Kalpaz.*

11) *MamathaBhatnagar and NitinBhatnagar. 2011. Effective Communication and Soft Skills. Person Education.*

12) *Meenakshi Raman, Sangeeta Sharma. Technical Communication Principles and Practice Harold Wallace and Ann Masters. Personality Development. Cengage Publishers*

Course :	*AGH 111*	***Credit:***	*1(1+0)*	***Semester-I***
Course title:	*Agricultural Heritage*			

Syllabus

Teaching Schedule (Theory)

Lecture	**Topics**	**Weightage (%)**
1	Introduction of Indian agricultural heritage, Need and importance for studying Agricultural Heritage	6
2 & 3	Ancient agricultural practices, Paleolithic age (old stone age), Mesolithic period, Neolithic Agricultural Revolution Chalcolithic culture (Bronze age) and Beginning of Agriculture in India: Archeological and historical facts	12
4	Indus civilization, Vedic civilization and Relevance of heritage to present day of agriculture	6

5, 6 & 7	Status of farmers in the society during Indus, Vedic, Buddhist, Mauryan, Gupta and Sangam periods, commodity trade etc. and present status of modern agriculture and farmer in society	16
8 & 9	Plant production through indigenous traditional knowledge	12
10	Crop voyage in India and world.	12
11	Agriculture scope in India and Maharashtra Chronological agricultural technology development in Indian Agriculture	8
12 & 13	Importance of agriculture and agricultural recourses available in India i.e. land, weather, irrigation, labour, capital, market etc.	10
14	Crop significances and classification	8
15	National agriculture setup in India	4
16	Indian agricultural concerns and future prospects	6
	Total	**100**

Suggested Readings:

1) A text book on Agricultural heritage of India by D. Kumari M. Veeral
2) Introductory Agriculture ICAR e Course
3) Ancient Indian heritage by Varahamihira\'S India set of 2vol.
4) History of Agriculture in India up to C 1200 Ad Vol. V part I
5) Principles of Agronomy and Agricultural Heritage by ICAR
6) Nene, Y.L. and Choudhary, S.L. (2002). Agricultural heritage of India. *Asian Agri. History foundation, Secundrabad.*
7) Randhawa, M.S., (1980-86). A history of Agriculture in India. Vol. I, II, III and IV. *Indian council of Agricultural Research, New Delhi*.
8) Raychaudhuri, S.P. (1964). Agriculture in ancient India. Indian council of Agricultural Research, New Delhi.
9) Razia Akbar (Tr) (2000). Muskha Dar Fauni – Falahat (The art of agriculture). Agri – History Bulletin No. 3. *Asian Agri. History foundation, Secundrabad.* Agricultural development today and tomorrow Vol. I :- Arun Kumar
10) Ayachit, S.M. (Tr) 2002. Kashyapiya Krishisukti (A treatise on Agriculture by Kashyapa). Agri. – History Billetin No. 4. Asian – Agri. History foundation, Secundrabad
11) Choudhary, S.L., Sharma, G.S. and Nene, Y.L. 2000. Ancient and medievel history of Indian agriculture and its relevance to sustainable agriculture in the 21st century. Proceedings of the summer school held from 28 May to 17

June 1999. Rajasthan College of Agriculture, Udaipur, India.

12) Economic survey of Maharashtra 2015-16.

13) Economic survey of Maharashtra 2016-17.

Course :	*MATH 111*	***Credit:***	*2(2+0)*	***Semester-I***
Course title:	*Elementary Mathematics*			

Syllabus

Theory

Matrices-Definition of matrices, Addition of matrices, Subtraction of matrices, Scalar Multiplication, product of Matrices, Types of Matrices, Transpose of matrix, minor and cofactor. Inverse of matrix by adjoint method upto third order.

Determinants -Definition of determinant as a function of square matrices, evaluation of determinant of second and third order only. Properties of determinants.

The Plane Co-ordinate Geometry- Distance Formula, Section Formula, Section formula for internal division, Section formula for External division.(Without proofs).

Straight Lines- Equation of co-ordinate axes, Equation lines parallel to axes, Slope -Intercept form of equation of line, Slope -Point form of equation of line, Two Point form of equation of line, Intercept form of equation of line, General form of equation of line(Statements of form of equations only), Point of intersection of two straight lines, Angle between two straight lines, conditions for two lines to be parallel and perpendicular.

Circle – Definition of circle, various forms of equation of circle i.e. centre-radius form, standard form, three point form, diameter form and General form.

Mensuration- Illustration of ordinates of curve and common distance between ordinates, Statement of Simpson's $1/3^{rd}$ Rule(Without proof), Examples based on Simpson's rule.

Function, Limit & Continuity- Definition of function, types of function, Theorems on limits (statement only), Definition of continuity, Simple Problems on limit, Simple Problems on continuity.

Differential Calculus-Definition of Derivatives, Differentiation of simple functions(Formulae's), Derivatives of Sum ,difference, product and quotient of two functions(statement only), Differentiation of function of function(statement only), simple problems based on it.

Integral Calculus - Indefinite integral : Definition, integrals of elementary functions (Formulae) Theorems, Integration of functions by decomposition method,

Examples based on it.

Integral Calculus & its Application -Definite integral **:**Definition of Definite Integral, Examples based on it, Area under simple well-known curves.(simple problem based on it.)

Teaching Schedule (Theory)

Lecture	Topics	Weightage (%)
1,2	Definition of matrices, Addition of matrices, Subtraction of matrices, Scalar Multiplication, product of Matrices, Types of Matrices, Transpose of matrix, minor and cofactor. Inverse of matrix by adjoint method upto third order.	11
3	Definition of determinant as a function of square matrices, evaluation of determinant of second and third order only. Properties of determinants.	06
4,5	Distance Formula, Section Formula, Section formula for internal division, Section formula for External division.(Without proofs).	11
6,7	Equation of co-ordinate axes, Equation lines parallel to axes, Slope -Intercept form of equation of line, Slope -Point form of equation of line, Two Point form of equation of line, Intercept form of equation of line, General form of equation of line(Statements of form of equations only), Point of intersection of two straight lines, Angle between two straight lines, conditions for two lines to be parallel and perpendicular.	11
8,9	Definition of circle, various forms of equation of circle i.e. centre-radius form, standard form, three point form, diameter form and General form.	11
10,11	Illustration of ordinates of curve and common distance between ordinates, Statement of Simpson's $1/3^{rd}$ Rule(Without proof), Examples based on Simpson's rule.	11
12,13	Definition of function, types of function, Theorems on limits (statement only), Definition of continuity, Simple Problems on limit, Simple Problems on continuity.	11
14,15,16	Definition of Derivatives, Differentiation of simple functions(Formulae's), Derivatives of Sum ,difference, product & quotient of two functions(statement only), Differentiation of function of function(statement only), simple problems based on it.	16
17	Definition, integrals of elementary functions (Formulae) Theorems, Integration of functions by decomposition method, Examples based on it.	06

18	Definite integral **:**Definition of Definite Integral, Examples based on it, Area under simple well-known curves.(simple problem based on it.)	06
	Total	**100**

Suggested Readings:

1) A Text Book of Mathematics, 11th Part-I and Part II, 12th Part-I and Part-II-Maharashtra State Board of secondary and Higher secondary Education-Pune.
2) Mensuration- I by Pierpoint.
3) A text book Agricultural Mathematics by Ms. A. A. Chaudhari et.al.

Course :	*BIO 111*	***Credit:***	*2(1+1)*	***Semester-I***
Course title:	*Introductory Biology*			

Syllabus

Teaching Schedule (Theory)

Lecture	**Topic**	**Weightages (%)**
1	Introduction to the living world. Composition and biological classification.	5
2	Diversity and characteristics of life.Definition of diversity; studying relationship between different organisms.	5
3	Origin of life ; theories of origin of life ,Oparin-Haldane theory of chemical origin of life.	5
4	Evolution and Eugenics ; evidences of organic evolution, theories of evolution; Definition of Eugenics , genetics and Mendel's experiment.	10
5	Binomial nomenclature and classification.	10
6 & 7	Cell and cell division: Cell Structure, Composition and cell organelles and their functions; Mitosis and meiosis their significance	15
8,9,10 & 11	Morphology of flowering plants. (roots, stems, leaves, flowers and fruits)	25
12	Seed and seed germination: Structure of monocot and dicot seed, Types of germination, factors affecting germination	5
13,14 &15	Plant systematic – Study of families *viz*.	15

	A) Brassicaceae, B) Fabaceae, C) Poaceae	
16	Role of animals in agriculture.	5
	Total	**100**

Practical

Experiment	**Topic covered**
1	Morphological studies of flowering plant.
2	Study of different root system and their Modifications.
3	Study of different forms of stems and their modifications.
4	Study of Branching pattern of plants.
5	Study of leaves and their modifications.
6	Study of stipules of leaves, leaf blade leaf venation.
7	Study of inflorescence, flowers and aestivation
8	Study of reproduction organs and placentation.
9	Study of fruits and their different parts.
10	Seed germination studies in different crops.
11	Study of Cell, Tissue and cell division through specimens and slides
12	Internal structure of root, stem and leaf of monocot and dicot plants.
13	Description of plant belongs to family Brassicacea. viz. Mustard/ Cabbage/ Cauliflower/ Radish. (Any one)
14	Description of plant belongs to family Fabaceae. viz. Pigeon pea/ Pea/ Cowpea/ Wal. (Any one)
15	Description of plant belongs to family Poaceae. viz. Rice/ wheat/ Jowar/ Maize. (Any one)

Suggested Readings:

1) *Cell Biology, Genetics, Molecular Biology and Evolution by P.S. Verma, V.K. Agrwal. **Publisher**- S. Chand and Company Ltd. Ram Nagar New Delhi.*
2) *Evolution of Vertebrates by Edwin H. Colbert, Publisher- A Wiley, Interscience Publication, John Wiley and Sons New York.*
3) *A class- book of Botany by A.C. Dutta, Publisher- Oxford University press YMCA Library Building. 1 Jai Singh Road, New Delhi 110001, India*
4) *Fundamentals of Genetics by B.D. Singh, Publisher- Kalyani Publishers B-I/1292, Rajinder Nagar, Ludhiana- 141008*
5) *A Text book of Practical Btoany-2 by Dr. Ashok M. Bendre, Dr. Ashok Kumar, Publisher- Rastogi Publications Shivaji Road, Meerut – 25002, India*
6) *Botany- An introduction to Plant Biology by Jamesh D. Mauseth, Publisher- Continental Prakashan 1962, Pune*

7) *Anatomy of seed Plants by A.C. Datta, Sigh V. Pande P.G, Publisher- Sai printopack New Delhi Rastogi, Publication Meerut*

8) *Hand book of Animal Husbandry by ICAR, New Delhi Publication, Publisher- Directorate of knowledge management in agriculture, Krishi Anusandhan Bhavan, Pusa New Delhi 110012*

Course :	*HVE 111*	***Credit:***	*1(1+0)*	***Semester-I***
Course title:	*Human Values & Ethics*			

Syllabus

Theory

UNIT I

Universal human aspirations: Happiness and prosperity; Human values and ethics: Concept, definition, significance and sources; Fundamental values: Right conduct, peace, truth, love and non-violence; Ethics: professional, environmental, ICT; Sensitization towards others particularly senior citizens, developmentally challenged and gender.

UNIT II

Spirituality, positive attitude and scientific temper; Team work and volunteering; Rights and responsibilities; Road safety; Human relations and family harmony; Modern challenges and value conflict: Sensitization against drug abuse and other social evils; Developing personal code of conduct (SWOT Analysis); Management of anger and stress.

Teaching Schedule(Theory)

Lecture	**Topic**	**Weightage (%)**
1	Universal human aspirations: Happiness and prosperity	6
2	Human values and ethics: Concept, definition	6
3	Human values and ethics: Significance and sources	6
4	Fundamental values: Right conduct, peace, truth, love and non-violence	8
5	Ethics: professional, environmental	6
6	Ethics: ICT	8

7	Sensitization towards others particularly senior citizens, developmentally challenged and gender	8
8-9	Spirituality, positive attitude and scientific temper	8
10-11	Team work and volunteering, Rights and responsibilities	8
12	Road safety; Human relations and family harmony	8
13	Modern challenges and value conflict, Sensitization against drug abuse and other social evils	6
14	Developing personal code of conduct (SWOT Analysis)	8
15	Management of anger	6
16	Stress Management	8
	Total	**100**

Suggested Readings:

A) Text Books:

1) Gaur RR, Sangal R & Bagaria GP. 2011. A Foundation Course in Human Values and Professional Ethics. Excel Books.
2) Nagrajan R. S. 2006. Professional Ethics and Human Values. Text book. New Age International (P) Ltd Publishers.
3) Sharma RA. 2011. Human Values and Education -Axiology, Inculcation and Research. R. Lall Book Depot.
4) Sharma RP & Sharma M. 2011. Value Education and Professional Ethics. Kanishka Publishers.
5) Srivastava S. 2011. Human Values and Professional Ethics. S K Kataria & Sons.
6) Srivastava S. 2011. Environmental Science. S K Kataria & Sons.
7) Tripathi A.N. 2009. Human Values. New Age International (P) Ltd Publishers.

B) Reference Books:

1) Mathur SS. 2010. Education for Values, Environment and Human Rights. RSA International.
2) Encyclopedia of Ethics, 2nd ed. D. H. Hill Ref. BJ63 .E452001 3 vols.

Course :	*NCC 111*	***Credit:***	*1(0+1)*	***Semester-I***
Course title:	*National Cadet Core*			

Syllabus

Practical

Aims, objectives, organization of NCC and NCC song. DG's cardinals of discipline.

2. Drill- aim, general words of command, attention, stands at ease, stand easy and turning.

3. Sizing, numbering, forming in three ranks, open and close order march and dressing.

4. Saluting at the halt, getting on parade, dismissing and falling out.

5. Marching, length of pace, and time of marching in quick/slow time and halt. Side pace, pace forward and to the rear.

6. Turning on the march and wheeling. Saluting on the march.

7. Marking time, forward march and halt.

8. Changing step, formation of squad and squad drill.

9. Command and control, organization, badges of rank, honours and awards

10. Nation Building- cultural heritage, religions, traditions and customs of India. National integration.

11. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizen.

12. Leadership traits, types of leadership. Character/personality development.

13. Civil defense organization, types of emergencies, fire fighting, protection,

14. Maintenance of essential services, disaster management, aid during development projects. 15. Basics of social service, weaker sections of society and their needs, NGO's and their contribution, contribution of youth towards social welfare and family planning.

16. Structure and function of human body, diet and exercise, hygiene and sanitation.

17. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health.

18. Adventure activities

19. Basic principles of ecology, environmental conservation, pollution and its control.

20. Precaution and general behaviour of girl cadets, prevention of untoward incidents, vulnerable parts of the body, self defense.

Semester II:National Cadet Corps

1. Arms Drill- Attention, stand at ease, stand easy. Getting on parade. Dismissing and falling out. Ground/take up arms, examine arms.
2. Shoulder from the order and vice-versa, present from the order and vice-versa.
3. Saluting at the shoulder at the halt and on the march. Short/long trail from the order and vice-versa.
4. Guard mounting, guard of honour, Platoon/Coy Drill.
5. Characteristics of rifle (.22/.303/SLR), ammunition, fire power, stripping, assembling, care, cleaning and sight setting.
6. Loading, cocking and unloading. The lying position and holding.
7. Trigger control and firing a shot. Range Procedure and safety precautions. Aiming and alteration of sight.
8. Theory of groups and snap shooting. Firing at moving targets. Miniature range firing.
9. Characteristics of Carbine and LMG.
10. Introduction to map, scales and conventional signs. Topographical forms and technical terms.
11. The grid system. Relief, contours and gradients. Cardinal points and finding north. Types of bearings and use of service protractor.
12. Prismatic compass and its use. Setting a map, finding north and own position. Map to ground and ground to map.
13. Knots and lashings, Camouflage and concealment, Explosives and IEDs.
14. Field defenses obstacles, mines and mine lying. Bridging, watermanship
15. Field water supplies, tracks and their construction.
16. Nuclear, Chemical and Biological Warfare (NCBW)
17. Judging distance. Description of ground and indication of landmarks.
18. Recognition and description of target. Observation and concealment. Field signals. Section formations.
19. Fire control orders. Fire and movement. Movement with/without arms. Section battle drill.
20. Types of communication, media, latest trends and developments.

Course :	*NSS 111*	***Credit:***	*1(0+1)*	***Semester-I***
Course title:	*National Service Scheme*			

Syllabus

Teaching Schedule (Practical)

Exercise	Topic	Weightages (%)
1.	Introduction and basic components of NSS: Orientation: history, objectives, principles, symbol, badge; regular programmes under NSS, organizational structure of NSS,	7
2.	Code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health	7
3.	NSS programmes and activities Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey,	7
4.	Analysing guiding financial patterns of scheme, youth programme/ schemes of GOI,	7
5.	Coordination with different agencies and maintenance of diary	6
6.	Understanding youth Definition, profile, profile, categories, issues and challenges of youth;	6
7.	Opportunities for youth who is agent of the social change	6
8.	Community mobilisation Mapping of community stakeholders, designing the message as per problems and their culture;	6
9.	Identifying methods of mobilisation involving youth-adult partnership	6
10.	Social harmony and national integration Indian history and culture,	6
11.	Role of youth in nation building, conflict resolution and peace-building	6
12.	Volunteerism and shramdan Indian tradition of volunteerism, its need, importance, motivation and constraints;	6
13.	Shramdan as part of volunteerism	6
14.	Citizenship, constitution and human rights Basic features of constitution of India, fundamental rights and duties,	6
15.	Human rights, consumer awareness and rights and rights to information	6
16.	Youth and yoga History, philosophy, concept, its impacts, yoga as a tool for healthy lifestyle, preventive and curative method.	6

Course :	*PEY 111*	***Credit:***	*1(0+1)*	***Semester-I***
Course title:	*Physical Education and Yoga*			

Syllabus

Physical Education (Practical)

Introduction to physical education definition, objectives, scope, and importance; physical culture; Warming up - Need and requirement of first aid.Meaning and importance of Physical Fitness and Wellness; Physical fitness components -speed, strength, endurance, power, flexibility, agility, coordination and balance;Methods of Training; aerobic and anaerobic exercises; weight training, circuit training, Interval training, Fartlek training;

Skill of Volleyball, Rules & Regulation, Advance Skill of Volleyball, Specific Warming up,Skill of Football Rules & Regulations, Advance Skill of Foot ball & Specific Warming up, Skill of Kabaddi Rules & Regulations. Advance Skill of Kabaddi, Skill of Kho-Kho, Rules & Regulations. Advance Skill of Kho-Kho, & Specific Warming up,

Yoga (Practical)

Yoga- History, Meaning and importance, Role of yoga in life. Asans and indigenous way for physical fitness, and curative exercise. Introduction to asanas and its importance, pranayama, meditation and yogic kriya.Omkar, Yogic Suksma vyayamas,

Yogasan- Asanas in Standing posture (Tadasana, Vrikshasana, Padahastasana, Ardha-Chakrasana, Trikonasana), Sitting postures (Asanas viz: Bhadrasana, Vjrasana, Ardha-Ustrasana, Ushtrasana, sasakasana and Vakrasana), Prone postures (Makarasana, Bhujangasana and Salabhasana) and Supine posture (Setubandhasana, uttanapadasana, Ardha-halasana, and Pavanamuktasana, Shavasana),

Suryanamaskar, Yognidra, Kapalbhati, Pranayam, Meditation in different mudras

Teaching Schedule (Practical)

Exercise	**Topic**	**Weightage (%)**
1	Introduction to physical education definition, objectives, scope, and importance; physical culture; Warming up - Need and requirement of first aid.	04
2	Meaning and importance of Physical Fitness and Wellness; Physical fitness components -speed, strength, endurance, power,	06

	flexibility, agility, coordination and balance; Methods of Training; aerobic and anaerobic exercises; weight training, circuit training, Interval training, Fartlek training;	
3	Skill of Volleyball, Rules & Regulation, Advance Skill of Volleyball, Specific Warming up,	06
4	Skill of Football Rules & Regulations, Advance Skill of Foot ball & Specific Warming up	06
5	Skill of Kabaddi Rules & Regulations. Advance Skill of Kabaddi, Skill of Kho-Kho, Rules & Regulations. Advance Skill of Kho-Kho, & Specific Warming up	10
6	Skill of Basket ball Rules & Regulation, Advance skill of Basket ball & Specific warming up	06
7	Skill of Table tennis, Rules & Regulations, Advance skill of Table tennis. Sikll of Badminton, Rules & Regulations. Advance skill of Badminton, Specific Warming up.	06
8	Skill of Athletics, Long and Short Distance running, Sill of Athletics Jumping events, Throwing events	06
9	Yoga- History, Meaning and importance, Role of yoga in life	06
10	Omkar, Yogic kriya, Yogic Suksma vyayamas	06
11	Yogasana- in Standing posture (Tadasana, Vrikshasana, Padahastasana, Ardha-Chakrasana, Trikonasana),	06
12	Yogasana- in Sitting postures (Asanas viz: Bhadrasana, Vjrasana, Ardha-Ustrasana, Ushtrasana, sasakasana and Vakrasana)	07
13	Yogasana- in Prone postures (Makarasana, Bhujangasana and Salabhasana)	06
14	Yogasana- in Supine posture (Setubandhasana, Uttanapadasana, Ardha-halasana, and Pavanamuktasana, Shavasana)	06
15	Suryananskars, Yognidra	06
16	Kapalbhati,Pranayam, Meditation in different mudras,	07
	Total	**100**

Suggested Reading:

1) *O.P. Aneja. Encyclopedia of Physical education, sports and exercise science (4 volumes).*
2) *Anil Sharma. Encyclopedia of Health and Physical Education (7 Volumes).*
3) *N V Chaudhery, R Jain. Encyclopedia of Yoga Health and Physical Education (7 Volumes).*
4) *Pintu Modak, O P Sharma, Deepak Jain. Encyclopedia of Sports and Games with latest rules and regulations (8 volumes).*

5) *Physical Education And Recreational Activities by Deepak Jain, Year of Pub.: 2011*

6) *Dimensions of Physical Education by Anil Sharma, Year of Pub.: 2011*

7) *Physical Fitness by Vijaya Lakshmi Year of Pub.: 2005*

8) *Research Process In Physical Education And Sports: An Introduction by K. G. Jadhav, Sachin B. Pagare and Sinku Kumar Singh, Year of Pub.: 2011*

9) *Sports Training And Biomechanics In Physical Education by Sinku Kumar Singh Year of Pub.: 2011*

10) *Test, Measurement and Evaluation in Physical Education by P. L. Karad Yearof Pub.: 2011*

11) *Foundations of Physical Education, Exercise Science, and Sport by Deborah A. Wuest,Charles A. Bucher*

12) *Light on Yoga by B. K. S Iyangar, Publication: Schocken, Edn. 31st : 1995,*

13) *The Key Muscles of Hatha Yoga by Ray Long, Publication: Bandh Yoga, Edn.; 3rd : 2006*

14) *Hatha Yogas Pradipika by Yogi Swatmarama, Publishcation: Bihar School of Yoga, Edn. 26th :1998*

15) *Yoganidra by swami saraswati, pblication, yoga publication trust, munger, edn 3rd 1976*

16) *Yog Darshan of Patanjali by Harikrishna Das Goyenka, Publication: Geeta Press Gorakhpur, Year: 2013*

17) *Patanjali Yogasutras by Swami Premeshanand, Publication: Advaita Asharm, Edn.: 2015*