Study Scheme & Syllabus of

Bachelor of Technology

(Agriculture Engineering)

Batch 2019 onwards

By

Department of Academics

IK Gujral Punjab Technical University

SEMESTER 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BTAG301-19	Agriculture for Engineers	3	1	0	40	60	100	4
BTAG302-19	Farm Machinery	3	1	0	40	60	100	4
BTAG303-19	Thermodynamics and Heat Engine	3	1	0	40	60	100	4
BTAG304-19	Wasteland Development	3	1	0	40	60	100	4
BTAG305-19	Irrigation Engineering	3	1	0	40	60	100	4
BTAG306-19	Agriculture for Engineers Lab	0	0	2	60	40	100	1
BTAG307-19	Farm Machinery Lab	0	0	2	60	40	100	1
BTHU301-19	Soft Skills-I	0	0	2	60	40	100	1
BTAG308-19	Institutional Training*	0	0	4	60	40	100	2
BMPD301-19	Mentoring and Professional Development	0	0	2	Satisfactory / Un-Satisfactory			Non-Credit
Total		**15**	**5**	**12**	**440**	**460**	**900**	**25**

*** Institutional Training after 2nd semester during summer vacations**

AGRICULTURE FOR ENGINEERS

Subject Code: BTAG301-19

Unit - I

Soil Characteristics: Nature and origin of soil**,** Soil forming rocks and minerals, their classification and composition**,** Soil forming processes**,** Classification of soils**,** Soil taxonomy orders**,** Important soil physical properties and their importance**,** Soil particle distribution**,** Soil inorganic colloids – their composition**,** Ion exchange in soil and nutrient availability.

Unit – II

Soil Organic Matter: Its composition and decomposition, effect on soil fertility, saline and sodic soils Quality or irrigation water, Essential plants nutrients, Functions and deficiency symptoms in plants, Important inorganic fertilizers and their reactions in soils. Soil water plant relationship**,** Crop rotation**,** cropping systems**,** Mixed cropping, Relay cropping

Unit - III

Agronomy: Definition and scope of agronomy, Classification of crops, Effect of different weather parameters on crop growth and development, Principles of tillage, Tilth and its characteristics,

Horticulture: Scope of horticultural and vegetable crops**,** Soil and climatic requirements for fruits Soil and climatic requirements for Vegetables**,** improved varieties of horticulture crops High-tech horticulture- Poly-houses for flowers and vegetables.

Unit –IV

Criteria for Site Selection of Horticulture Crops: Layout and planting methods, Nursery raising, Macro and micro propagation methods, Pant growing structures, Pruning & training, Fertilizer application process, Fertigation, Harvesting, Grading and packaging, Post-harvest practices, Garden tools, management of orchard, Extraction and storage of vegetables seeds.

Recommended Books:

1. T.D. Biswas and S.K. Mukherjee, ‘Soil Science’, TMH Publication.
2. T. Yellamanda and G.H. Sankara Reddy, ‘Principle of Agronomy’, Kalyani Publication.
3. Jitendra Singh, ‘Basic Horticulture’, Kalyani Publisher.
4. K.K. Mehta, ‘Reclamation of Alkali Soil in India’, Oxford & IBH.
5. Maharaj Singh, ‘Education for Sustainable Agriculture’, Indian J. Agronomy.

FARM MACHINERY

Subject Code: BTAG302-19

Unit – I

Tillage: primary and secondary tillage equipment, Zero and conservation tillage equipment Forces acting on tillage tools, Hitching systems and controls, Measurement of forces of tillage tools, Draft measurement of tillage equipment, Types of dynamometer; spring type, Hydraulic type and strain gauge types.

Unit – II

Objectives of Farm Mechanization: Classification of farm machines, Materials of construction and heat treatment, Principles of operation and selection of machines used for production of crops, field capacities and economics.

Unit – III

Earth Moving Equipment: Their construction & working principles, Bulldozer, Elevators, Scraper and Digger, Sowing, planting & transplanting equipment, various type Zero till ferti-drill Seed and planting metering devices, their calibration and adjustments. Furrow openers and covering devices, Fertilizer application equipment and their metering devices.

Unit – IV

Weed control and Plant protection equipment- sprayers and dusters, their calibration selection, constructional features of different components, harvesting machinery- mowers, windrowers, reapers, reaper binders and forage harvesters, forage chopping & handling equipment, Description working principle of threshing machineries, grain and straw combine.

Recommended Books:

1. R.A. Kepner, Roy Bainer, 'Principles of Farm Machinery,' CBS Publication.
2. Radhey Lal, 'Agricultural Engineering', Saroj Publication.
3. Jagdishwar Sahay, 'Elements of Agricultural Engineering', Standard Publishers Distributors.
4. R. Suresh, 'Farm Power and Machinery Engineering', Standard Publishers Distributors.
5. Triveni Singh Prasad, 'Farm Machinery,' PHI, **2016.**

THERMODYNAMICS AND HEAT ENGINE

Subject Code: BTAG303-19

Unit – I

Thermodynamics Properties: Closed and open system Flow and non-flow processes Gas laws of thermodynamics Internal Energy Application of first law in heating and expansion of gases in non-flow processes First law applied to steady flow processes.

Unit – II

Second Law of Thermodynamics: Kelvin-Planck statement**,** Clausius Statement, Reversible processes, Carnot cycle, Carnot theorem, Steam Generator- Classification of steam boilers, Lancashire boiler, Locomotive boiler, Boiler mountings, Boiler accessories, Desirable properties of working fluid used for power plants, Rankine cycle

Unit – III

Entropy: Physical concept of entropy, Change of entropy of gases at constant volume, Change of entropy of gases at constant Pressure, Change of entropy of gases at constant Temperature, Change of entropy of gases at reversible adiabatic process Change of entropy of gases at poly tropic process.

Unit – IV

Thermodynamic Air Cycle: Air Standard efficiency, Engine efficiencies and terms, Otto cycle, Diesel cycle, Dual cycle, mean effective pressure, Measurement of IP and BP, HBC.

Recommended Books

1. D.S. Kumar, 'Thermodynamics', Katson Publication 1st Edition, **2009**.
2. D.K. Jha, 'A Text Book of Thermodynamics', Discovery Publishing House.
3. R.S. Khurmi & J.K. Gupta, 'A Text Book of Thermal Engineering,' S. Chand & Company Limited, reprint **2002**.
4. P.K. Nag, 'Engineering Thermodynamics', TMH Publication.
5. R. Yadav, 'Thermodynamics and Heat Engines', Central Publishing House, **2002**.

WASTELAND DEVELOPMENT

Subject Code: BTAG304-19

Unit – I

Land Degradation: Concept, classification - arid, semiarid, humid and sub-humid regions, denuded range land and marginal land, Wastelands - factors causing, classification and mapping of wastelands, planning of wastelands development - constraints, agro-climatic conditions, development options, contingency plans.

Unit – II

Conservation Structures: Gully stabilization, ravine rehabilitation, sand dune stabilization, water harvesting and recycling methods (In brief). **Afforestation**-Agro-horti-forestry Silvopasture methods forage and fuel crops– socioeconomic constraints, Shifting cultivation, optimal land use options.

Unit – III

Wasteland Development: Hills, semi-arid, coastal areas, water scarce areas, reclamation of waterlogged and salt-affected lands. Mine spoils- impact, land degradation and reclamation and rehabilitation, slope stabilization and mine environment management.

Unit-IV

Micro-irrigation- Use in wastelands development, Sustainable wasteland development- drought situations, socio-economic perspectives. Government policies, Participatory approach. Preparation of proposal for wasteland development and benefit-cost analysis.

Recommended Books

1. I.P. Abrol and V.V. Dhruva Narayana, 'Technologies for Wasteland Development,' ICAR, New Delhi, **1998.**
2. S.K. Ambast, S.K. Gupta and Gurbachan Singh, 'Agricultural Land Drainage – Reclamation of Waterlogged Saline Lands'.
3. H.R. Yadav, 'Management of Wastelands', Concept Publishing Company, New Delhi.
4. S.C. Kalwar, 'Wastelands and Planning for Development', Concept Publishing Company **2008.**
5. C. Karthikeyan, K. Thangaraja, C. Cinthia Fernandez and K. Chandrakandon, 'Dryland Agriculture and Wasteland Management', Atlantic Publishers, New Delhi, **2009.**

IRRIGATION ENGINEERING

Subject Code: BTAG305-19

Unit- I

Source of irrigation water, measurement of irrigation water, infiltration, application of soil plant atmospheric continuum and principles of fluid mechanics to design of irrigation system, water balance equation and evaluation of different components; measurement of evaporation and evapo-transpiration.

Unit- II

Water resource development and utilization in India, Surface water resources ground water resources, India's water budget, utilization of water resources, factors a fleeting water utilization, major river basins of India

Unit- III

History and development of Irrigation in India, Classification of irrigation projects, canal network, water distribution pattern, system of levying irrigation charges.

Unit- IV

Estimation of irrigation water requirement and irrigation scheduling: efficiencies of irrigation systems, Hydraulics, Design and evaluation of surface, sub-surface, overhead and drip irrigation

systems; design of water conveyance systems including control structures, design principles, Selection of pumps and prime movers.

Recommended Books:

1. A.M. Michael, 'Irrigation Theory and Practice', Vikas Publications, New Delhi.
2. S.K. Majumdar, 'Irrigation Engineering', Tata McGraw Hill Publishing Co. Ltd., New Delhi, **1983**.
3. Om Prakash, 'Irrigation and Water Management', Rama Publishing House, Meerut.
4. K.K. Schwab, 'Soil and Water Conservation Engg.' John Wiley and Sons Inc. New York.
5. R. Lal 'Irrigation Hydraulics', Saroj Prakashan, Allahabad, **1978**.
6. N.N. Basak, 'Irrigation Engineering', McGraw Hill Education, **1999.**

AGRICULTURE FOR ENGINEERS LAB.

Subject Code: BTAG306-19

EXPERIMENTS

1. Study of Garden tools, implements and plant protection equipment.
2. Identification of rocks and minerals.
3. Study of manures and fertilizers.
4. Study of layout in different irrigation systems.
5. To study of Pruning and training of orchard trees.
6. Examination of soil profile in the field.
7. Determination of bulk density.
8. Identification of weeds.
9. Determination particle density and porosity of soil.
10. Study of different Cultivator.
11. Study of different weed control methods.
12. Determination of organic carbon of soil.
13. Fertilizer application methods.
14. Study of different orchard layout methods.
15. Identification of crops and their varieties seeds.

FARM MACHINERY LAB.

Subject Code: BTAG307-19

EXPERIMENTS

1. To study animal drawn and tractor drawn mould Board ploughs.
2. Introduction to various farm machineries.
3. To study Indigenous or country plough.
4. To study the starting and stopping of Diesel Engine.
5. Introduction, construction and working of earth moving equipment.
6. To study four stroke cycle engine.
7. Construction and working of rotavator and other rotary tillers.
8. To study cultivators and its important functions.
9. Weeding equipment- their use and adjustment
10. Field operation of showing and planting equipment and their adjustments.
11. Field capacity and field efficiency measurement for at least two machines/implements.
12. Working of Paddy Transplanter and their calibration.
13. To Study the field capacity of sprayer and duster.
14. To study Air cooling system and its advantages.
15. Study on methods of repair, maintenance and off season storage of farm equipment.
16. Working of seed-cum-fertilizer drills and their calibration.

SOFT SKILLS-I

Subject Code: **BTHU301-19**

UNIT-1

Soft Skill: Introduction to Soft Skills, Aspects of Soft Skills, Identifying your Soft Skills, Negotiation skills, Importance of Soft Skills, Concept of effective communication.
Self-Discovery: Self-Assessment, Process, Identifying strengths and limitations, SWOT Analysis Grid.

UNIT-2

Forming Values: Values and Attitudes, Importance of Values, Self-Discipline, Personal Values - Cultural Values-Social Values-some examples, Recognition of one's own limits and deficiencies.

UNIT-3

Art of Listening: Proxemics, Haptics: The Language of Touch, Meta Communication, Listening Skills, Types of Listening, Listening tips.

UNIT-4

Etiquette and Manners: ETIQUETTE- Introduction, Modern Etiquette, Benefits of Etiquette, Taboo topics, Do's and Don'ts for Men and Women. MANNERS- Introduction, Importance of manners at various occasions, Professional manners, Mobile manners. CORPORATE GROOMING TIPS- Dressing for Office: Do's and Don'ts for Men and Women, Annoying Office Habits.

Recommended Books:

1. K. Alex, S. Chand Publishers.
2. Butterfield, Jeff, 'Soft Skills for Everyone', Cengage Learning, New Delhi, **2010**.
3. G.S. Chauhan and Sangeeta Sharma, 'Soft Skills', Wiley, New Delhi, **2016**.
4. Klaus, Peggy, Jane Rohman & Molly Hamaker, 'The Hard Truth About Soft Skills', Harper Collins E-books, London, **2007**.
5. S.J. Petes, Francis, 'Soft Skills and Professional Communication', Tata McGraw Hill Education, New Delhi, **2011**.

SEMESTER 4th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BTAG401-19	Surveying and Levelling	3	1	0	40	60	100	4
BTAG402-19	Theory of Machines	3	1	0	40	60	100	4
BTAG403-19	Engineering Economics	4	0	0	40	60	100	4
BTAG404-19	Soil & Water Conservation	3	0	0	40	60	100	3
BTAG405-19	Farm Power	3	1	0	40	60	100	4
BTAG406-19	Surveying and Levelling Lab.	0	0	2	60	40	100	1
BTAG407-19	Theory of Machines Lab.	0	0	2	60	40	100	1
BTAG408-19	Soil & Water Conservation	0	0	2	60	40	100	1
BTHU401-19	Soft Skills-II	0	0	2	60	40	100	1
EVS101-18	Environmental Studies	2	0	0	50	00	50	Non-Credit
BMPD401-19	Mentoring and Professional Development	0	0	2	Satisfactory / Un-Satisfactory			Non-Credit
Total		**18**	**3**	**10**	**490**	**460**	**950**	**23**

SEMESTER 5TH		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BTAG501-19	Agricultural Structure and Environmental Control	3	0	0	40	60	100	3
BTAG502-19	Soil and Water Conservation Structures	3	1	0	40	60	100	4
BTAG503-19	Dairy and Food Engineering	2	1	0	40	60	100	3
BTAG504-19	Tractor System, Controls & Operation	3	1	0	40	60	100	4
BTAG505-19	Principles of Plant Protection	2	0	0	40	60	100	2
BTAG506-19	Protected Cultivation and Post Harvest Technology	1	0	0	60	40	100	1
BTAG507-19	Soil and Water Conservation Structures Lab.	0	0	2	60	40	100	1
BTAG508-19	Tractor System, Controls & Operation Lab.	0	0	2	60	40	100	1
BTAG509-19	Dairy and Food Engineering Lab.	0	0	2	60	40	100	1
BTAG510-19	Principles of Plant Protection Lab.	0	0	2	60	40	100	1
BTAG511-19	Protected Cultivation and Post-Harvest Technology Lab.	0	0	2	60	40	100	1
BTAG512-19	Training-II*	0	0	4	60	40	100	2
BTHU501-19	Soft Skills-III	0	0	2	60	40	100	1
BMPD501-19	Mentoring and Professional Development	0	0	2	Satisfactory / Un-Satisfactory			Non-Credit
Total		**14**	**3**	**18**	**680**	**620**	**1300**	**25**

***4 weeks training after 4th semester during summer vacations**

SURVEYING AND LEVELLING

Subject Code: BTAG401-19

Unit – I

Surveying: Principle and basic concepts of surveying, Plans and maps, Classification of surveying, basic measurements, Units of measurement, Types of Scales, Recording the measurement, Principal of chain surveying, Types of Chains, Types of Ranging Chaining Chain and tape errors and corrections, Selection of survey station and lines, offset measurement, Obstacles in chaining and ranging.

Unit – II

Traversing: Methods of traversing, Prismatic compass**,** Surveyors compass Angle and bearing**,** quadrantal system**,** Local attraction, Dip of angle, magnetic declination**,** Plotting a traverse survey**,** Errors in compass survey**,** Bow ditch's rule**,** Transit rule.

Unit – III

Plane Tabling: Plane tabling instruments and accessories**,** Methods and principal**,** two points problem**,** three points problem**,** Errors in plane tabling,

Theodolite: Theodolite traversing**,** Theodolite Surveying**,** Ranging by theodolite**,** Temporary and Permanent adjustment of theodolite.

Unit – IV

Levelling: Definition, Basic principal of levelling**,** Benchmark**,** Types of levels optical**,** Principal causes telescopes sensitivity of bubble tubes**,** levelling staff**,** Temporary adjustment,

Permanent adjustment of levels, Field book entries**,** types of levelling**,** Simple and differential levelling, Check levelling & reciprocal levelling**,** Precise levelling**,** profile levelling.

Recommended Books:

1. B.C. Punamia, 'Surveying and Levelling', Vol-I & Vol-II, Laxmi Publications, **2005.**
2. Kanetkar & Kulkarni, 'Surveying and Levelling Part-1', Vidyarthi Griha Prakashan, Pune**.**
3. S.K. Duggal, 'Surveying', Vol I & II, Tata McGraw Hill, **2006.**
4. R. Agor, 'Surveying', Khanna Publishers.
5. S.S. Bhavikatti, 'Surveying & Levelling', Vol. I & II, **2009.**

THEORY OF MACHINES

Subject Code: BTAG402-19

Unit – I

Elements, links, pairs, kinematics chain, and mechanisms, classification of pairs and mechanisms, Lower and higher pairs, four bar chain, slider crank chain and their inversions, Degree of freedom, Determination of velocity and acceleration using graphical (relative velocity and acceleration) method. Instantaneous centres.

Unit – II

Cam, Types of cam, Terminology used in cam-follower system, Cam profile, Gear train, Simple, compound, reverted, and epicyclical gear trains, Determination of velocity ratio and train value by tabular method.

Unit – III

Introduction to Belt drives, types of drives, belt materials, Length of belt, power transmitted, velocity ratio, belt size for flat and V belts. Effect of centrifugal tension, Creep and Slip on power transmission, Chain drives.

Unit – IV

Introduction to Clutches, Types of clutches (Single disc, multiple disc, and cone clutches). Balancing of rotating masses in one and different planes,

Governor: Introduction, Types, Constructional details and Analysis of Watt, Porter, Proell governor, Sensitiveness, stability, hunting, isochronisms, power and effort of a governor, flywheel.

Recommended Books:

1. R.S. Khurmi, 'Theory of Machines', S. Chand Publication.
2. S.S. Rattan, 'Theory of Machines', 4th Edn., McGraw Hill Education Publication.
3. Jagdish Lal, 'Theory of Mechanisms & Machines', Metropolitan Book Co.
4. V.P. Singh, 'Theory of Machines', Dhanpat Rai Pub.
5. Thomas Beven, 'Theory of Machines', Longman's Green & Co., London.

ENGINEERING ECONOMICS

Subject Code: BTAG403-19

Unit – I

Economics: Definitions, Nature and Scope of economics, Difference between Microeconomics and Macro- economics, theory of demand & supply; meaning and determinants of demand, law of demand, law of supply Equilibrium between demand and supply elasticity, price elasticity, income elasticity of price, income and cross elasticity.

Unit – II

Theory of Production: Production function, meaning, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur), Law of variable proportions & returns to scale Cost; meaning of short run & long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost. Break even analysis; meaning, explanation, numerical.

Unit – III

Markets: Meaning, types of markets & their characteristics (Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly). **National Income**- meaning, stock and flow concept, NI at current price, NI at constant price, GNP, GDP, NNP, NDP, Personal income, disposal income.

Unit –IV

Unemployment: Meaning, types, causes, remedies, Inflation- meaning, types, causes, measures to control, Money- meaning, functions, types, Monetary policy and Fiscal policy - meaning, objectives and tools**.** Human Resource Management- Definitions, objectives of manpower planning, process, sources of recruitment, process of selection.

Recommended Books:

1. R. Paneerselvam, 'Engineering Economics', PHI.
2. N. Gregory Mankiw, 'Principles of Economics', Cengage Learning.
3. K.K. Dewett & M.H. Navalur, 'Modern Economic Theory', S. Chand Publications.
4. Vaish and Sundharam, 'Principles of Economics', Ratan Prakashan Mandir, Agara.

SOIL AND WATER CONSERVATION

Subject Code: BTAG404-19

Unit – I

Introduction: Soil erosion - causes, types and agents of soil erosion; water erosion – forms of water erosion, mechanics of erosion; gullies and their classification, stages of gully development; characteristics of contours and preparation of contour maps.

Unit – II

Erosion Control Measures: Agronomical measures - contour cropping, strip cropping, mulching; mechanical measures - terraces – level and graded broad base terraces and their design, bench terraces & their design, layout procedure, terrace planning, bunds - contour bunds, graded bunds and their design; gully and ravine reclamation.

Unit – III

Wind Erosion: Factors affecting wind erosion, mechanics of wind erosion, soil loss estimation, wind erosion control measures - vegetative, mechanical measures, wind breaks and shelter belts, sand dunes stabilization.

Unit – IV

Soil Loss Estimation: Universal soil loss equation and modified soil loss equation, determination of their various parameters, Sedimentation - sedimentation in reservoirs and streams, estimation and measurement, sediment delivery ratio, trap efficiency.

Design Principle of Channel: Most Economical trapezoidal, introduction to water harvesting techniques; introduction to stream water quality and pollution.

Recommended Books:

1. Michael, 'Principles of Agricultural Engineering', Vol.-2, Jain Brothers, **2013.**
2. R. Suresh, 'Soil & Water Conservation Engineering', Standard Publishers Distributors.
3. Ghanshyam Das, 'Hydrology and Soil Conservation Engineering: Including Watershed Management', 2nd Edn., PHI Publication, **2009.**
4. V.V.N. Murthy, 'Land and Water Management Engineering', Kalyani Publishers, **2013.**
5. R.P. Tripathi and H.P. Singh, 'Soil Erosion and Conservation', 1st Edn., New Age Publishers, **1993.**
6. Bimal Chandra Mal, 'Introduction to Soil and Water Conservation Engineering', Kalyani Publishers, **2011.**

FARM POWER

Subject Code: BTAG405-19

Unit – I

Sources of farm power - conventional & non-conventional energy sources and their utilization, classification of tractors and IC engines, Review of thermodynamic principles of IC (CI &SI) engine and deviation from ideal cycle.

Unit – II

Engine & their components, their construction, operating principles and functions, valves and valve mechanism, Firing order and diagram, criteria for selection. Study of constructional details, adjustments and operating principles of fuel and air supply, cooling, lubricating, ignition, governing and electrical systems.

Unit – III

IC engine fuels - their properties & combustion of fuels, gasoline tests and their significance, diesel fuel tests and their significance, detonation and knocking in IC engines, Properties of coolants, anti-freeze and anti-corrosion materials, lubricant types & study of their properties.

Unit – IV

Transmission systems of wheel and track type tractors: clutch, gear box, differential and final Drive mechanism PTO system, type, standardization, belt and pulley on tractor and their standardization. Preventive maintenance of various systems.

Recommended Books:

1. Jagdishwar Sahay, 'Elements of Agricultural Engineering', St. Publishers Distributors.
2. John B. Lijiedahal, Paul K. Turn quist, 'Tractors and their Power Units', CBS Publication.
3. S.C. Jain, 'Farm Tractor maintenance and repair,' Standard Publishers Distributors.
4. Donnell Hunt, 'Farm Power and Machinery Management', Medtech, 10th Edn., **2013.**
5. Suresh, 'Farm Power and Machinery Engineering', Standard Publishers Distributors.

SURVEYING & LEVELLING LAB.

Subject Code: BTAG406-19

EXPERIMENTS

1. Chain survey of an area and preparation of map
2. Measurement of distance, ranging a line.
3. Compass survey of an area and plotting of compass survey.
4. Contour survey of an area and preparation of contour map.
5. Introduction of software in drawing contour.
6. Plane table survey, different methods of plotting, two point & three-point problem.
7. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
8. To study of different methods of levelling, height of instrument, rise & fall methods.
9. Advancement of Total stations.
10. Measurement of horizontal and vertical angle by theodolite.
11. Determination of height of an inaccessible object.
12. Determination of area of irregular figure by using planimeter.
13. Height of object by using theodolite.
14. Setting out of circular curves in the field using different methods.
15. Determination of tachometric constants and determination of reduced levels by tachometric observations.

THEORY OF MACHINE LAB.

Subject Code: BTAG407-19

EXPERIMENTS

1. To study the various inversions of kinematic chains.
2. Conduct experiments on various types of governors.
3. Demonstration of static and dynamic balancing in the laboratory.
4. Determination of gyroscopic couple (graphical method).
5. Balancing of rotating masses (graphical method).
6. Cam profile analysis (graphical method)
7. Motion analysis of Epicyclical gear trains using tabular and formula methods.
8. Analysis of 4-bar mechanism slides crank mechanism and their inversions.
9. Draw graphs between height and equilibrium speed of a governor.
10. To draw circumferential and axial pressure profile in a full journal bearing.
11. To determine coefficient of friction for a belt-pulley material combination.
12. Determination of moment of inertia of flywheel.
13. To study the flywheel and governor action in laboratory.
14. To study the static and dynamic balancing using rigid blocks
15. To draw displacement, velocity & acceleration diagram of four bar mechanism.

SOIL AND WATER CONSERVATION LAB.

Subject Code: BTAG408-19

EXPERIMENTS

1. Study of different types of conservation measures.
2. Design of drop spillway.
3. Design of drop inlet spillway.
4. Design of farm pond.
5. Demonstration of Bench Terrace in the farming.
6. Study of USLE/MUSLE parameter.
7. Study about the Contour farming.
8. Determination from nutrient availability in soil.
9. To demonstrate the conservation of tillage.
10. Study of erosion checked by row cropping pattern.
11. Study of contour cropping effect on soil erosion.
12. Study of bund /graded/contour bund.
13. Design of grassed water ways.
14. Computation of soil erosion by USLE/MUSLE.
15. Design of Trapezoidal water ways.

SOFT SKILLS-II

Subject Code: **BTHU401-19**

UNIT-1

Developing Positive Attitude: Introduction. Formation of attitude. Attitude in workplace. Power of positive attitude. Examples of positive attitudes. Negative attitudes. Examples of negative attitude. overcoming negative attitude and its consequences.

Improving Perception: Introduction. Understanding perception. perception and its application in organizations.

UNIT-2

Career Planning: Introduction. Tips for successful career planning. Goal setting-immediate, short term and long term. Strategies to achieve goals. Myths about choosing career.

UNIT-3

Art of Reading: Introduction. Benefits of reading. Tips for effective reading. the SQ3R technique. Different stages of reading. determining reading rate of students. Activities to increase the reading rate. Problems faced. Becoming an effective reader.

UNIT-4

Stress Management: Introduction. meaning. positive and negative stress. Sources of stress. Case studies. signs of stress. Stress management tips. Teenage stress.

Recommended Books:

1. K. Alex, S. Chand Publishers.
2. Rizvi, M. Ashraf, 'Effective Technical Communication', McGraw Hill.
3. Mohan Krishna & Meera Banerji, 'Developing Communication Skills', Macmillan.
4. Kamin, Maxine, 'Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams & Leaders', Pfeiffer & Amp; Company, Washington, DC, **2013.**

ENVIRONMENTAL STUDIES

Subject Code: **EVS101-18**

MENTORING AND PROFESSIONAL DEVELOPMENT

Subject Code: BMPD401-19

Guidelines regarding Mentoring and Professional Development
The objective of mentoring will be development of:

- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

Part – A (Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B (Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.

AGRICULTURAL STRUCTURE AND ENVIRONMENTAL CONTROL

Subject Code: BTAG501-19

Course Objectives:

To provide the technical knowledge of structures on the farm and to expose the basic concepts of design.

Unit - I

Planning and layout of farmstead, Physiological reactions of livestock to solar radiation and other environmental factors, Livestock production facilities, BIS, Standards for dairy, piggery, poultry and other farm structures.

Unit - II

Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc.,: Design and construction of rural grain storage system, Engineering for rural living and development, rural roads, their construction cost and repair and maintenance.

Unit - III

Sources of water supply, Norms of water supply for human being and animals, drinking water standards and water treatment suitable to rural community, Site and orientation of building in regard to sanitation, community sanitation system; sewage system its design, cost and maintenance, design of septic tank for small family.

Unit - IV

Estimation of power requirement for domestic and irrigation, source of power supply, use of alternate source of energy, electrification of rural Housing, Scope, importance and need for environmental control, Renewable and non-renewable resources and their equitable use, concept of eco system, biodiversity of its conservation, environmental pollution and their control, solid waste management system, BOD and COD of food plant waste, primary and secondary treatment of food plant waste.

Recommended Books:

1. M.L. Hellickson and J.N. Walker, ‘Ventilation of Agricultural Structures’.
2. L.P. Bengtsson, ‘Farm Structures in Tropical Climates’.
3. J.H. Whitaker, ‘Agricultural Buildings and Structures. National Food & Energy’.
4. R.E. Phillips, ‘Farm Buildings: From Planning to Completion’.
5. ASAE, ‘Environmental Control for Animals and Plants Textbooks’.
6. J.S. Boyd, ‘Practical Farm Buildings’, A Textbook & Handbook.

SOIL AND WATER CONSERVATION STRUCTURES

Subject Code: BTAG502-19

Unit – I

Introduction and classification of structures, Functional requirements of soil erosion control structures. Flow in open channels, types of flow, state and regimes of flow. Concept of Specific energy and specific force. Runoff measuring structures-H flume and Parshall flume.

Unit – II

Hydraulic jump and its application, Energy dissipation due to jump, jump efficiency and relative loss of energy, Runoff measuring structures; General description of straight drop spillway, structural parts and functions, advantages and disadvantages of spillway. Hydrologic and hydraulic design.

Unit - III

Structural design of a drop spillway, Safety against sliding, overturning, crushing and tension, Chute spillway, general description and its components; Hydraulic design, energy dissipaters and design criteria of a SAF stilling basin and its limitations.

Unit –IV

Drop inlet spillway, general description, functional use and design criteria. Design of diversions. Small earth embankments, types and design principles. Maintenance of earthen dams. Farm ponds, site selection and their design and construction. Cost estimation of structures.

Recommended Books:

1. V.V.N. Murty, 'Land and Water Management Engineering', Kalyani Publication.
2. R. Suresh, 'Soil and Water Conservation Engineering', Standard Publishers, Distributors.

Ghanshyam Das, 'Hydrology and Soil Conservation Engineering', PHI Learning Private Ltd

DAIRY AND FOOD ENGINEERING

Subject Code: BTAG503-19

Unit - I

Dairy development in India. Engineering, chemical and thermal properties of milk and milk products (In brief), Composition and proximate analysis of food products.

Unit - II

Unit operation of various dairy and food processing systems, process flow charts for product manufacture, Deterioration in products and their controls.

Unit - III

Working principles of equipment for receiving, pasteurization, sterilization, homogenization, filling & packaging (Production of butter, Pannier & Cheese) dairy plant design and layout, composition and proximate analysis of food products. Determination in products and their controls.

Unit - IV

Physical, chemical and biological methods of food preservation, changes during processing, evaporation, drying, freezing juice extraction, filtration, membrane separation, thermal processing, plant utilities requirement.

Recommended Books:

1. Sharma, 'Dairy Science and Technology and Food and Dairy Engineering', 1st Edn., CBS, **2009.**
2. J.G. Brennan, Butters, Jr. N.D. Cowell and A.E.V. Lilly, 'Food Engineering Operations', Applied Science Publishers, **1976.**
3. A.W. Farrall, 'Engineering for Dairy and Food Products', Wiley Eastern Pvt. Ltd., New Delhi, **1967.**
4. H.G. Kessler, 'Food Engineering and Dairy Technology', V.A. Kessler, Frcising, Germany, **1981**.
5. Tufail Ahmad, 'Dairy Plant Engineering and Management', Kitab Mahal, **2003.**

TRACTOR SYSTEMS, CONTROL & OPERATION

Subject Code: BTAG504-19

Unit- I

Study of transmission systems, clutch, gear box, differential and final drive mechanism. Familiarization of brake mechanism. Ackerman and hydraulic steering and hydraulic systems.

Unit-II

Tractor power outlets: P.T.O., belt pulley, drawbar, etc. Tractor chassis mechanics and design for tractor stability.

Unit-III

Ergonomic considerations and operational safety, Introduction to tractor maintenance procedure and trouble shooting. Scheduled maintenance after 10, 50, 100, 250, 500 and 1000 Hrs. of operation. Safety hints.

Unit-IV

Top end overhauling. Fuel saving tips. Preparing the tractor for storage. Care and maintenance procedure of agricultural machinery during operation and off-season. Repair and maintenance and workshop requirements.

Recommended Books:

1. F.R. Jones, 'Farm Gas Engines and Tractors'.
2. E.L. Barger, Lijedehl, W.B. Carleton and E.G. Mc Kibben, 'Tractors and their Power Units'.
3. Radhey Lal and Dutta, 'Agricultural Engineering through solved examples'.
4. Irving Frazeee and V.E. Philip, 'Tractors and Crawlers'.

PRINCIPLES OF PLANT PROTECTION

Subject Code: BTAG505-19

Unit I

Insect Ecology- Introduction, environment and its components, effect of abiotic and biotic factors. Biotic potential, environmental resistance and causes of pest outbreaks in agro-ecosystem. Categories of pests. Insects, Pests and Crop Losses; Present agriculture and pest problems. Beneficial insects: important pollinators, weed killers and scavangers; their importance. Important non-insect pests: mites, rodents and birds.

Unit II

Introduction, importance and general characters of fungi, bacteria, fastidious bacteria, nematodes, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa and phanerogamic parasites. Definition, objectives, history, terms and concept of plant pathology.

Unit III

Insect pest and diseases of major field and horticultural crops and their management.

Unit IV

Plant protection equipments.

Recommended Books:

1. Introduction to Principles of Plant Pathology by R.S. Singh
2. Agricultural Pests of South Asia and Their Management. A. S. Atwal and G.S Dhaliwal. Kalyani Publishers, Ludhiana.
3. Principles of Insect Pest Management. G. S. Dhaliwal and Ramesh Arora. National Agricultural Technology Information Centre, Ludhiana.
4. Entomology at a Glance. R.C. Saxena and R. C. Srivastava. Agrotech Publishing Academy, Udaipur.

PROTECTED CULTIVATION AND POST HARVEST TECHNOLOGY

Subject Code: BTAG506-19

Unit I

Introduction, planning, design and application of green houses. Plant response to greenhouse environment. Green house equipment. Materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses.

Unit II

Cost estimation and economic analysis. Winnowing. Groundnut decorticators. Maize and castor shellers. Drying- grain drying, types of drying, types of dryers.

Unit IV

Storage grain storage, types of storage structures. Cleaning and grading equipment for fruits and vegetables. Size reduction equipment. Evaporation- principle and types. Quality standards.

Unit IV

Crops selection and constraints of greenhouse cultivation. Growing media, drainage, flooding and leaching, soil pasteurization, nutrient film technique (NFT) / hydroponics.

SOIL AND WATER CONSERVATION STRUCTURES LAB.

Subject Code: BTAG507-19

EXPERIMENTS

1. Study of different parts of H-flume and Parshall flume.
2. Construction of specific energy and specific force diagram.
3. Measurement of hydraulic jump parameters and amount of energy dissipation.
4. Design of drop spillway.
5. Stability analysis of drop spillway
6. Design of Chute spillway.
7. Design of drop inlet spillway.
8. Design of small earthen embankments.
9. Design of a SAF energy dissipater.
10. Design of water harvesting structures.
11. Cost estimation of structures.
12. Visit to a watershed to understand the runoff pattern.

TRACTOR SYSTEMS, CONTROL & OPREATION LAB.

Subject Code: BTAG508-19

EXPERIMENTS

1. Introduction to transmission systems and components.
2. Study of clutch functioning, parts and design problem on clutch system.
3. Study of different types of gear box, calculation of speed ratios, design problems on gear box.
4. Study on differential and final drive and planetary gears.
5. Study of brake systems and some design problems; Steering geometry and adjustments.
6. Study of hydraulic systems in a tractor, hydraulic trailer and some design problems.
7. Traction performance of a tractor wheel.
8. Finding C.G. of a tractor by weighing technique.
9. Finding CG of a tractor using suspension/balancing techniques; Finding moment of Inertia of a tractor.
10. Appraisal of various controls in different makes tractors in relation to anthropometric measurements.

DAIRY AND FOOD ENGINEERING LAB.

Subject Code: BTAG509-19

EXPERIMENTS

1. Study of a composite pilot milk processing plant & equipment
2. Study of pasteurisers
3. Study of sterilizers
4. Study of homogenisers
5. Study of separators
6. Study of butter churners
7. Study of evaporators
8. Study of milk dryers
9. Study of freezers
10. Design of food processing plants & preparation of layout
11. Visit to multiproduct dairy product
12. Determination of physical properties of food products
13. Estimation of steam requirements
14. Estimation of refrigeration requirements in dairy & food plant
15. Visit to Food industry

PRINCIPLES OF PLANT PROTECTION LAB

Subject Code: BTAG510-19

1. Identification of various insect pests and diseases of important field and horticultural crops.
2. Principles and working of various plant protection equipment.

PROTECTED CULTIVATION AND POST HARVEST TECHNOLOGY LAB.

Subject Code: BTAG511-19

Practical: Study of different types of green houses. Calculation of air rate exchange system. Estimation of drying rate of agricultural products. Testing of soil and water suitability and fertigation requirements for greenhouses. Study of threshers, Winnowers, groundnut decorticator and maize and castor shellers - their components, operation and adjustments. Improved grain storage structures. Study of dryers, cleaners and graders. Visit to commercial greenhouses. Growing media - their preparation and pasteurization/sterilization.

Soft Skills-III

Subject Code: BTHU501-19

UNIT-1

ART OF WRITING: Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication. ART OF BUSINESS WRITING: Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

BODY LANGUAGE: Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

TEAM BUILDING AND TEAM WORK: Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

TIME MANAGEMENT: Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procrastination.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, ‘Business Correspondence and Report Writing’, TMH, New Delhi, 2016.
3. N. Krishnaswami and T. Sriraman, ‘Creative English for Communication’, Macmillan.
4. Penrose, M. John, et al., ‘Business Communication for Managers’, Thomson South Western, New Delhi, 2007.
5. Holtz, Shel, ‘Corporate Conversations’, PHI, New Delhi, 2007.

MENTORING AND PROFESSIONAL DEVELOPMENT

Subject Code: BMPD501-19

Guidelines regarding Mentoring and Professional Development
The objective of mentoring will be development of:

- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

Part – A (Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B (Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.