MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI

TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : DIPLOMA IN AGRICULTURE ENGINEERING

COURSE CODE : AU

DURATION OF COURSE : 6 SEMESTERS **WITH EFFECT FROM 2012-13**

SEMESTER : THIRD **DURATION : 16 WEEKS**

PATTERN : FULL TIME - SEMESTER **SCHEME : G**

SR. NO	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME									SW (17300)
							PAPER HRS.	TH (1)		PR (4)		OR (8)		TW (9)		
				TH	TU	PR		Max	Min	Max	Min	Max	Min	Max	Min	
1	Applied Mathematics (Agriculture Engineering)	AMS	17349	03	01	--	03	100	40	--	--	--	--	--	--	
2	Engineering Mechanics (Agriculture Engineering)	EMC	17350	03	--	02	03	100	40	--	--	--	--	25@	10	
3	Hydrology	HLG	17351	03	--	02	03	100	40	25#	10	--	--	25@	10	
4	Thermodynamics and Heat Transfer	THT	17352	03	--	02	03	100	40	--	--	--	--	50@	20	**50**
5	Basic Electrical and Electronics Engineering	BEE	17353	04	--	02	03	100	40	25#	10	--	--	25@	10	
6	Computer Applications in Agricultural Engineering	CAA	17033	--	--	04	--	--	--	50#	20	--	--	25@	10	
7	Professional Practices	PPR	17034	--	--	03	--	--	--	--	--	--	--	50@	20	
			TOTAL	**16**	**01**	**15**	**--**	**500**	**--**	**100**	**--**	**--**	**--**	**200**	**--**	**50**

Student Contact Hours Per Week: **32 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 850**

@ - Internal Assessment, # - External Assessment, No Theory Examination, $ - Common to all branches,

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work

- Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.
- Code number for TH, PR, OR, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Third

Subject Title : Applied Mathematics (Agriculture Engineering)

Subject Code : 17349

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	01	--	03	100	--	--	--	100

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Applied mathematics is designed for its applications in engineering and technology. It includes the topics integration, differential equation, probability distribution. The connection between applied mathematics and its applications in real life can be understood and appreciated.

Derivatives are useful to find slope of the curve, maxima and minima of function, radius of curvature. Integral calculus helps in finding the area. In analog to digital converter and modulation system integration is important. Differential equation is used in finding curve. Probability is used in Metrology and quality control.

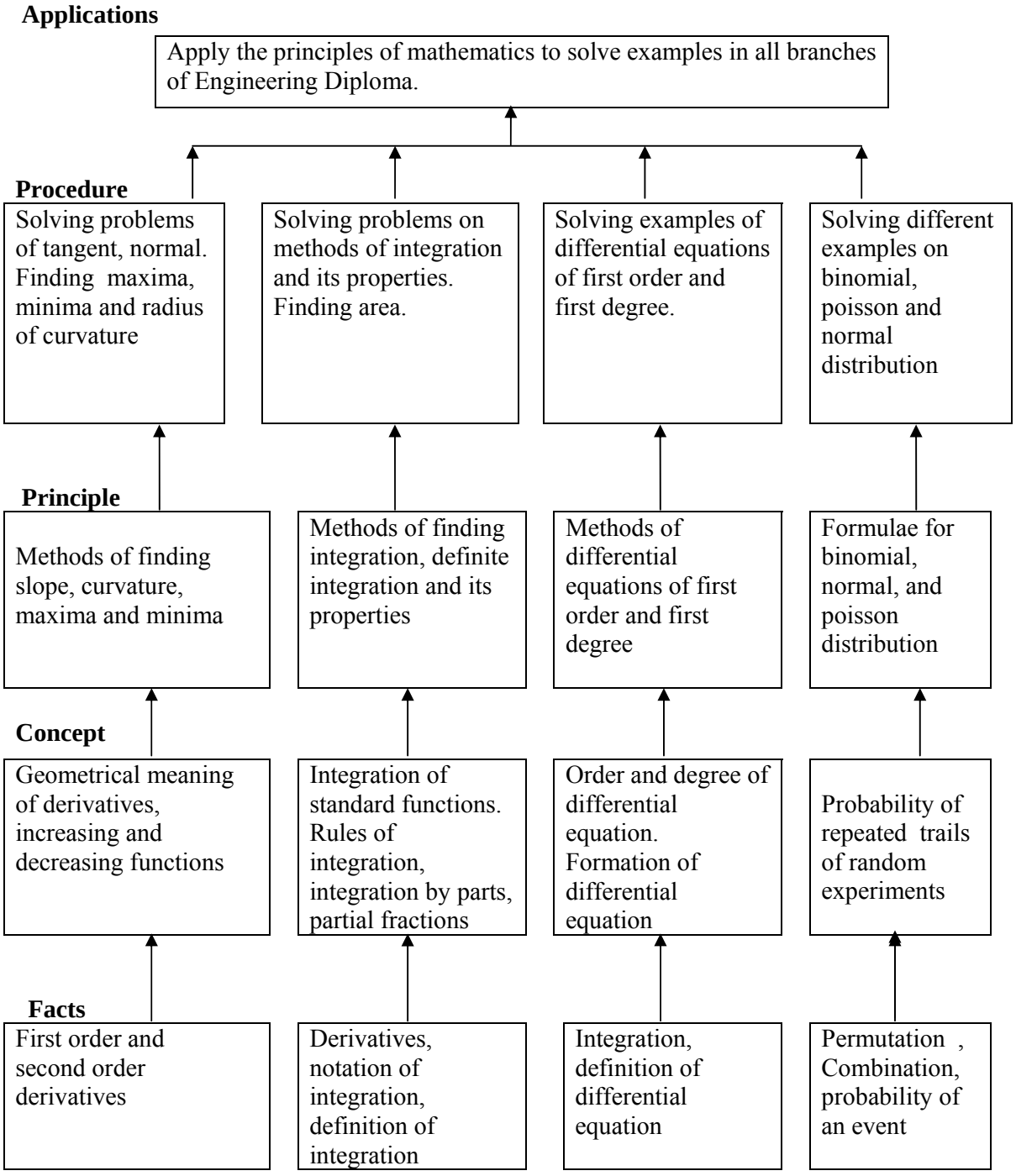
The fundamentals of this topic are directly useful in understanding engineering applications in various fields.

General Objectives:

Students will be able to:

1. Apply derivatives to find slope, maxima, minima and radius of curvature.
2. Apply integral calculus to solve different engineering problems.
3. Apply the concept of integration for finding area.
4. Apply differential equation for solving problems in different engineering fields.
5. Apply the knowledge of probability to solve the examples related to the production process.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
Topic-1 Applications of Derivative **Specific objectives :** ➢ Find slope, curvature, maximum and minimum value of functions related to different engineering applications. • Examples for finding slope , equations of tangent and normal to the curve • Maxima and minima. • Radius of curvature.	06	16
Topic-2 Integral Calculus		
2.1 Integration ---------- 20 **Specific objectives :** ➢ Integrate function using different method. • Definition of integration as anti derivative, rules of integration. • Integration of standard functions • Methods of integration Integration by substitution. Integration by partial fractions. Integration by parts and generalized rule by parts.	14	44
2.2 Definite Integrals ---------- 16 **Specific objectives :** ➢ Solve problems on definite integrals using the properties. • Definite integral- Definition, examples. • Properties of definite integrals without proof and simple examples.	08	
2.3 Application of Definite Integrals ----------08 **Specific objectives :** ➢ Find area. • Area under a curve. • Area between two curves.	04	
Topic 3 - Differential Equation.		
3.1 Differential equation **Specific objectives :** ➢ Solve the differential equation of first order and first degree ➢ Solve different engineering problems using differential equation • Differential equation- Definition, order and degree of a differential equation. Formation of differential equation containing single constant. • Solution of differential equation of first order and first degree for following types Variable separable form, Equation reducible to variable separable form. Linear differential equation. Homogeneous differential equation. Exact differential equation.	10	20

Topic 4 - Probability		
4.1 Probability **Specific objectives : ---------- 08** ➢ Solve different engineering problems related to probability process. • Definition of random experiment, sample space, event, occurrence of event and types of event (impossible, mutually exclusive, exhaustive, equally likely) • Definition of probability, addition and multiplication theorems of probability.	02	20
4.2 Probability Distribution ---------- 12 • Binomial distribution • Poisson's distribution • Normal distribution	04	
Total	**48**	**100**

Assignments:

Learning Resources:

1) Books:

Sr. No	Title	Authors	Publication
1	Mathematic for Polytechnic	S. P. Deshpande	Pune Vidyarthi Girha Prakashan' Pune
2	Calculus : Single Variable	Robert. T. Smith	Tata McGraw Hill
3	Higher Engineering mathematics	B. V Ramana	Tata McGraw Hill
4	Higher Engineering mathematics	H. K. Dass	S .Chand Publication
5	Higher Engineering Mathematics	B. S. Grewal	Khanna Publication, New Delhi
6	Applied Mathematics	P. N. Wartikar	Pune Vidyarthi Griha Prakashan, pune

2) **Websites :**

i) www.khan academy

Course Name : Diploma in Agriculture Engineering

Course code : AU

Semester : Third

Subject Title : Engineering Mechanics (Agriculture Engineering)

Subject Code : 17350

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

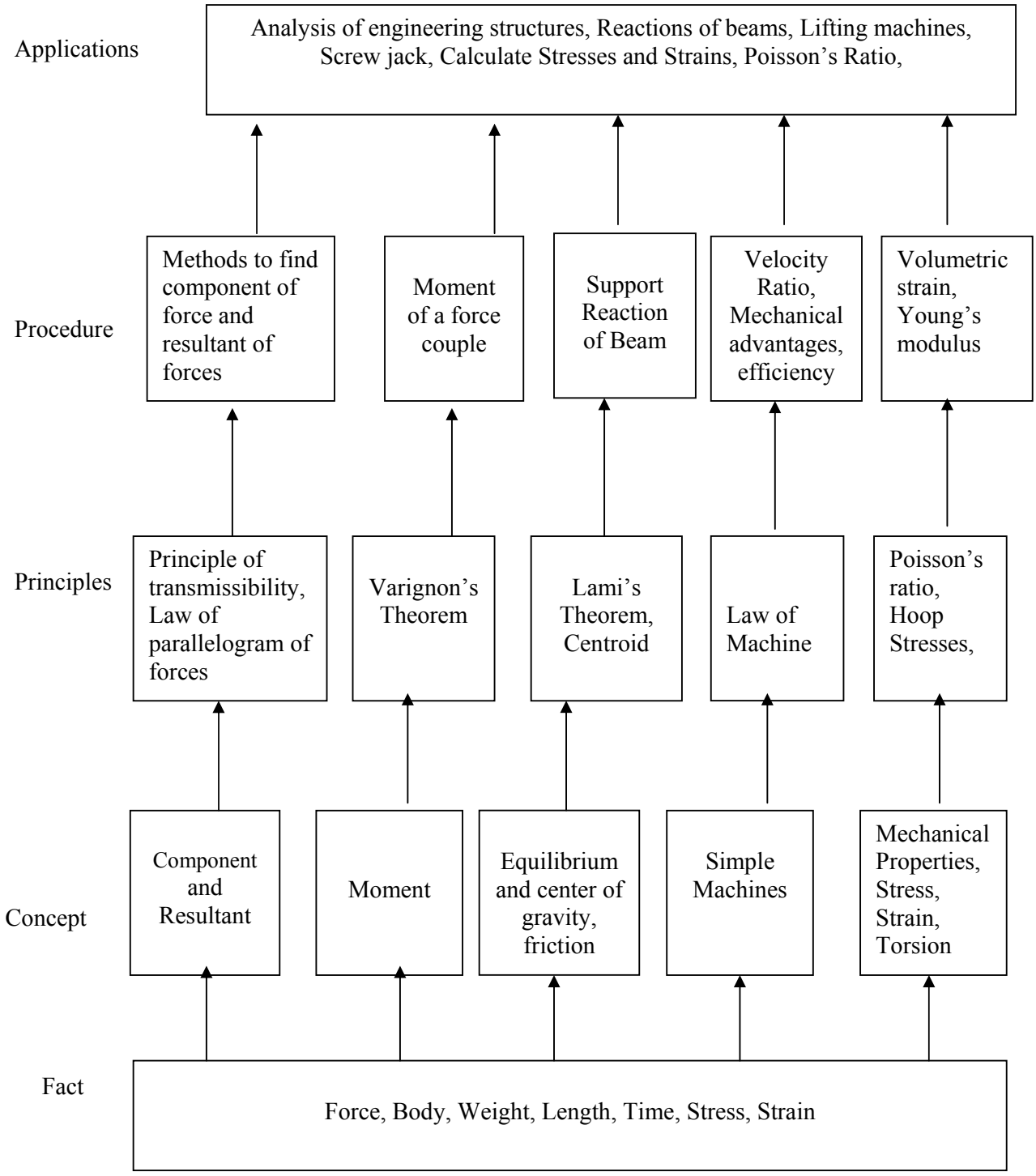
In day to day life we come across different structures, at the time of design of the structures analysis plays an important role. Perfect analysis is possible only when one knows the types and effect of forces acting on the structure.

This subject provides knowledge about the different types of forces/loads, their effects while acting in different conditions/systems. The subject also provides the knowledge about basic concepts of laws of engineering, their application to different engineering problem.

Objectives: The student will be able to**,**

1. Resolve the forces.
2. Find the resultant of given force system.
3. Find the reactions of beam.
4. Find the center of gravity of composite solids.
5. Find M.A., V.R., and Efficiency and establish law of machine.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
Topic 1: Force Contents: a. **Fundamentals: -** Definitions of mechanics, statics, dynamics. Engineering Mechanics, body, rigid body, mass, weight, length, time, scalar and vector, fundamental units, derived units, S.I. units. b. **Force**: - Definition of a force, unit force, Newton, S.I. unit of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility. c. **Resolution of a force:** Definition, Method of resolution, Types of component forces, Perpendicular components and Non-perpendicular components. d. **Moment of a force: -** Definition, measurement of moment of a force, S. I. unit, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments Varignon's theorem of moment and it's use, couple – definition, S.I. unit, measurement of a couple, properties of couple. e. **Force system: -** Definition, classification of force system according to plane and line of action f. **Composition of Forces**: - Definition, Resultant force, methods of composition of forces, I - Analytical method – (i) Trigonometric method (law of parallelogram of forces) (ii) Algebraic method (method of resolution), II - Graphical method: - Introduction, space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent, non-concurrent and parallel force system by analytical and graphical method.	08	20
Topics 2: Equilibrium: Contents: 2.1 Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram. 2.2 Lami's Theorem – statement and explanation, Application of Lami's theorem for solving various engineering problems. 2.3 Equilibrant – Definition, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system. 2.4 Beams – Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simply support, hinged, roller), classification of loads, point load, uniformly distributed load. Reactions of a simply supported and over hanging beam by analytical and graphical method.	06	14
Topics 3: Friction: Contents: 3.1 Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction angle of repose and coeff. of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction. 3.2 Equilibrium of bodies on level plane –external force applied horizontal and inclined up and down. 3.3 Equilibrium of bodies on inclined plane – external forces	06	14

is applied parallel to the plane, horizontal and incline to inclined plane.		
Topics 4: Centroid, Centre Of Gravity and Moment of Inertia: Contents: 4.1 **Centroid:** Definition of Centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure. 4.2 **Center of gravity:** Definition, center of gravity. Of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids. 4.3 **Moment of Inertia:** Concept & definition of Moment of inertia, radius of gyration., Moment of inertia of square, rectangular, circular, Triangular, only. (No derivation)	08	16
Topics 5: Simple Machines: 5.1 Definitions of simple machine, compound machine, load, effort, mechanical advantage, velocity ratio, input on a machine, output of a machine, efficiency of a machine, expression for mechanical advantage , velocity ratio and efficiency of a machine. 5.2 Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self-locking machine. 5.3 Study of simple machines : Simple axle and wheel, differential axle and wheel, Weston's differential pulley block, single purchase crab, double purchase crab, worm and worm wheel, geared pulley block, screw jack, pulleys: First, second and third system of pulleys, gear train, hoist mechanism.	10	18
Topic 6: Introduction to strength of Materials: 6.1 Mechanical properties – Elasticity, Plasticity, Rigidity, Ductility, Malleability, Toughness, Hardness, Brittleness, Creep, Fatigue. 6.2 Concept & Definition of Simple stresses & strains Types, tensile, compressive, Shear, single & double shear, Punching shear, Thermal stresses, Hoop stresses & corresponding strains. Hooke's law, Young's modulus, Modulus of Rigidity, stress-strain curves for ductile & brittle materials. 6.3 Volumetric Strain, Bulk modulus, Poisson's ratio. Relationship among E& G, 6.4 Concept of Pure Torsion, Assumptions in theory of pure Torsion, Torsion equation for solid circular shafts.	10	18
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Calculate the forces on given structure
2. Interpret the results

Motor Skills:

1. Handle the equipment carefully
2. Draw graph

List of Practicals:
The term work consist of any five experiments from Group A, B and graphical solution in Group C

Group A:

1. Verify law of polygon of forces
2. Verify law of moments
3. Verification of Lami's theorem
4. Forces in members of a jib crane.
5. Comparison of coefficient of friction of various pair of surfaces and
6. Determination of angle of repose
7. Equilibrium of parallel forces – simply supported beam reactions.
8. Experimental location of center of gravity of plane plate of uniform thickness.

Group B: To find MA, VR, Efficiency, Ideal Effort, Effort lost in friction for various loads and establish law of machine and calculate maximum efficiency. Also check the reversibility of a machine (Any five):

1. Differential axle and wheel
2. Weston's differential pulley block
3. Geared pulley block
4. Single purchase crab
5. Double purchase crab
6. Worm and worm wheel
7. Two sheave and three sheave pulley block
8. Screw jack.

Group C: A 2 Size drawing sheets containing graphical solutions for –

1. Concurrent force system: Two problems
2. Parallel force system: Two problems
3. Reactions of a beam: Two problems

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
1	Beer - Johnson	Engineering Mechanics	Tata McGraw Hill, Delhi
2	Basu	Engineering Mechanics	Tata McGraw Hill, Delhi
3	Joseph F. Shelley	Vector Mechanics for Engineers Vol. I & II	Tata McGraw Hill, Delhi
4	S. Ramamrutham	Strength of Material	Dhanpat Rai & Publication New Delhi
5	R. S. Khurmi	Strength of Material	S.Chand Company Ltd. Delhi

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Third

Subject Title : Hydrology

Subject Code : 17351

Teaching and Examination Scheme

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	25#	--	25@	150

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Hydrology is the science, which deals with the occurrence, distribution and disposal of water on the planet earth; it is the science which deals with the various phases of the hydrologic cycle. The study of hydrology is essential to equip the learner with knowledge and skills required for taking effective measures against soil erosion, construction and maintenance of water conservation structures and development of land for irrigation and agricultural purposes.

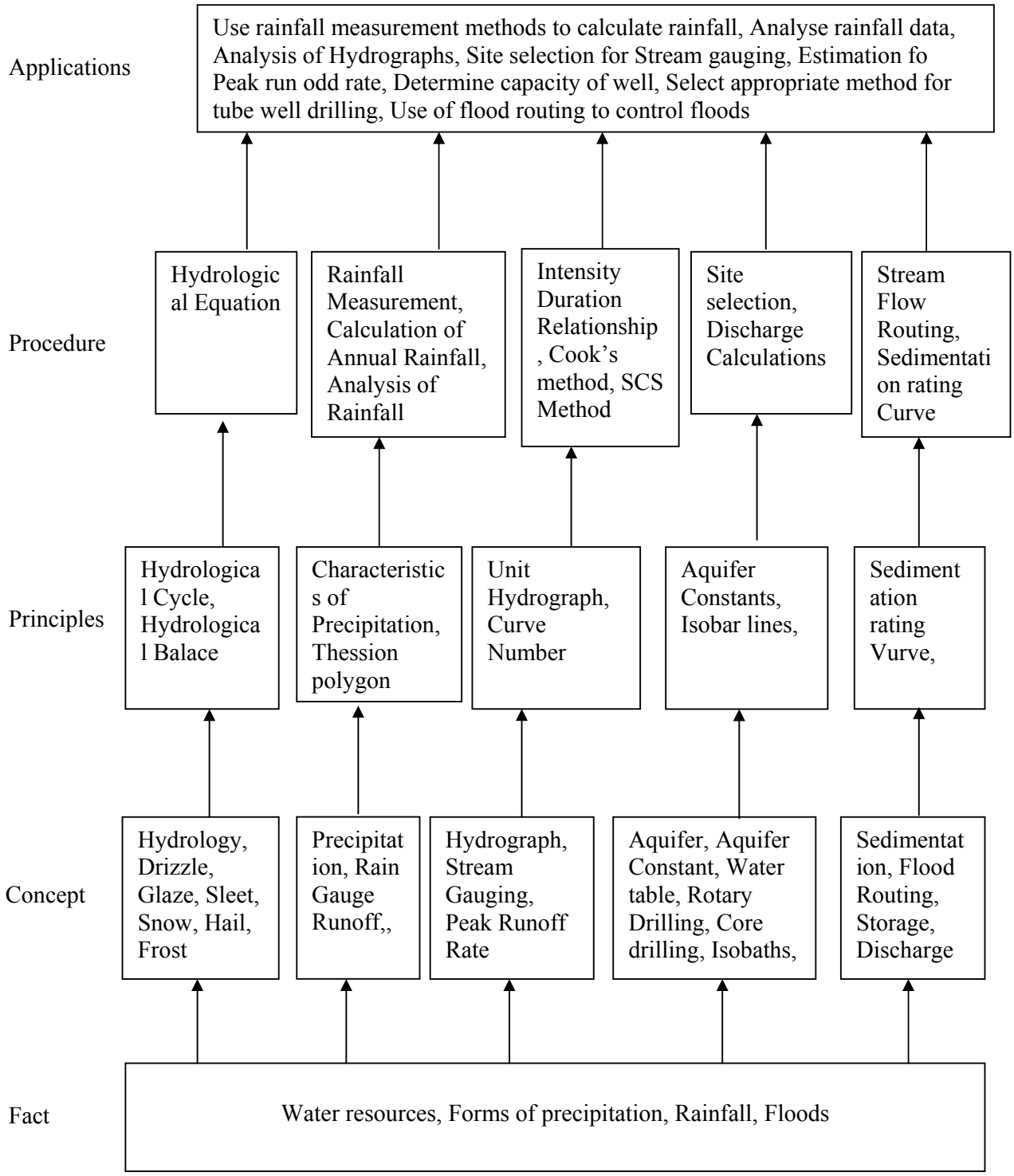
The contents of the subject have been developed to develop inculcate capabilities for performing the above mentioned task economically and effectively.

Objectives:

The student will be able to,

1. Measure the rate of rainfall and calculate the average annual rainfall by using different methods.
2. Calculate the runoff and yield by various methods.
3. Establish and develop unit hydrographs.
4. Estimate flood discharge and sedimentation.

Learning Structure:



Content Theory:

Chapter	Name of the Topic	Hours	Marks
01	**Hydrology and Hydrological cycle** 1.1Introduction, water resources and their importance, Hydrological cycle, hydrologic equation and its components, Geohydrological and hydrological balance. Scope of Hydrology. 1.2. Forms of precipitation – Drizzle, rain, glaze, sleet, snow, snowflakes, hail, dew and frost.	04	08
02	**Rainfall and runoff relationship** 2.1 Precipitation – Types of precipitation (Thermal, frontal, orographic and cyclonic), characteristics of precipitation – (frequency, intensity, depth and duration). 2.2 Rainfall and its measurement – types of rain gauges (Recording and Non recording). 2.3 Calculation of average annual rainfall (Arithmetical mean, Thession polygon and Isohytal methods), factors affecting rainfall. 2.4 Runoff, factors affecting runoff and estimation of runoff (Empirical formulae, curves and tables, Cooks method, Rational method and Unit hydrograph method). 2.5 Analysis of rainfall data – Probability analysis by Weibull's formula, return period and recurrence intervals, 2.6 Estimation of missing data, Test of consistency of rainfall records.	12	28
03	**Hydrographs** 3.1 Definitions and components of the hydrograph. 3.2 Unit hydrograph, propositions of the unit hydrograph, derivation of unit hydrograph and limitations of unit hydrograph. 3.3 Intensity-Duration relationship, Intensity-Duration frequency relationship, Depth Area duration relationship, plotting positions. Frequency Analysis, 3.4 Application of unit hydrographs	06	12
04	**Stream gauging** 4.1 Different methods of stream gauging. 4.2 Velocity measurement – Surface float, velocity rods and current meters. 4.3 Discharge calculations. 4.4 Site selection for stream gauging. 4.5 Estimation of peak runoff rate: rational method, Cook's method, SCS method. Numerical on above. 4.6 Curve Number method (estimation of runoff volume) Numerical on above.	08	16
05	**Well Hydraulics** 5.1 Ground water resources, Types of water bearing formation (Confined and unconfined aquifers). 5.2 Aquifer characteristics influencing yield of wells, Determination of aquifer constants, specific capacity of wells. 5.3 Different terms related to well hydraulics viz. water table, isobaths, isobar lines, drawdown and recharge of ground water. 5.4 Types of wells – (Open wells and tube wells), Construction	12	24

	feachers 5.5 Methods of drilling in tube wells – Rotary drilling, core drilling and percussion drilling. 5.6 Water yield calculations – Pumping test and recuperation test.		
06	**Flood Routing and Sedimentation** 6.1 Introduction, Methods of flood routing (Inflow, storage and discharge and modified pulse method). 6.2 Stream flow routing 6.3 Simple Numerical problems on above topics 6.4 Information about sedimentation 6.5 Sediment rating curve 6.6 Factors affecting sedimentation and reservoir sedimentation control. 6.7 Simple Numerical problems on above topics	06	12
	Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Analyse rain gauge charts.
2. Analysis of rainfall data.
3. Estimation of peak rainfall rate.

Motor Skills:

1. Use of rain gauges.
2. Ability to use meteorological instruments.

List of Experiments

1. Visit to meteorological observatory and study of meteorological instruments.
2. Study of different types of rain gauges.
3. Analysis of rain gauge charts.
4. Estimation of average rainfall depth.
5. Probability analysis of rainfall data by Weibull's method
6. Estimation of peak runoff rate by rational method
7. Estimation of peak runoff rate by Cook's method
8. Computation of runoff volume by Curve Number method
9. Study of stream gauging instruments (Stage level recorder and current meter)
10. Development of DRH from stage hydrograph
11. Development of unit hydrograph
12. Development of Dimensionless Unit Hydrograph

Reference Books:

Sr. No	Title	Author	Publisher
1	Land and Water Management Engineering	V.V.N. Murthy	Kalyani Publishers, New Delhi

2	Hydrology	H.M. Raghunath	Wiley Eastern Limited
3	Hydrology (Principles, Analysis and Design)	H. M. Raghunath	New Age International Publishers
4	Applied Hydrology	K.N. Mutreja	Tata McGraw Hill Publishing Co. Ltd., New Delhi
5	Watershed Hydrology	R. Suresh	Standard Publishers Distributors, New Delhi
6	Engineering Hydrology	K. Subramanya	Kalyani Publishers, New Delhi

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Third

Subject Title : Thermodynamics & Heat Transfer

Subject Code : 17352

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	50@	150

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

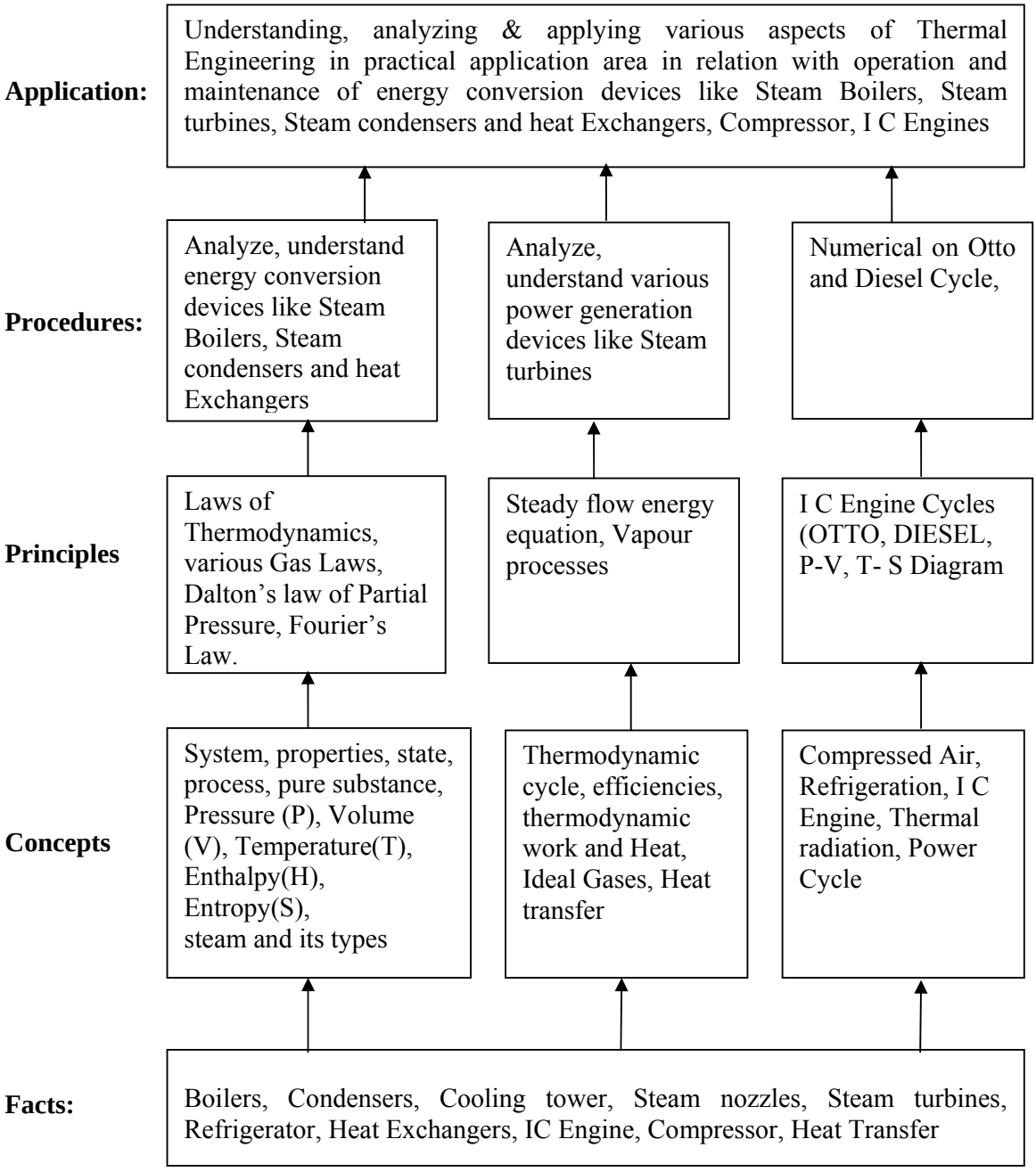
Rationale:

Agricultural engineers have to work with various power producing & power absorbing devices like boilers, turbines, compressors etc. In order to understand the principles, construction & working of these devices, it is essential to understand the concept of energy, work, heat & conversion between them. Hence it is important to study the subject of Thermal Engineering which is a core subject. It includes the study of basic laws & concept of thermodynamics, gas laws, properties of steam & generation. Heat transfer forms the basis for different power engineering application. Boilers find application in different process industries.

Objectives: The student will be able to**:**

1. To expose the fundamentals of thermodynamics and to be able to use it in accounting for the bulk behaviour of the sample physical systems.
2. To integrate the basic concepts into various thermal applications like IC engines, steam boiler, steam turbine, compressors, refrigeration.
3. To enlighten the various modes of heat transfer and their engineering applications. Use of standard steam tables, refrigeration tables and heat transfer data book are permitted

Learning Structure:



Theory Content:

Topic and Contents	Hours	Marks
Chapter 1: Basic Concepts and Laws of Thermodynamics 1.1 Concepts of pure substance, types of systems , properties of systems, Extensive and Intensive properties with units and conversion like P, V, ρ And temperature. Point function and path function. 1.2 Work and Energy, Thermodynamic definition of work, heat, difference between heat and work, P.E., K.E, Internal Energy, Flow work, concepts of enthalpy, entropy. 1.3 Laws of Thermodynamic Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, Second Law of Thermodynamics, Kelvin Plank, Clausius statements and their equivalence, Concept of perpetual motion machine 1 and 2. 1.4 Application of Thermodynamic laws Steady Flow Energy equation and its application to open system like boiler, engine, nozzle, turbine, compressor & condenser. 1.5 Application of Second law to Heat Engine, Heat Pump and Refrigerator.	06	12
Chapter 2: Ideal Gases 2.1 Concept of Ideal gas, Charle's law, Boyle's law, Avogadro's law, equation of state, Characteristic gas constant and universal gas constant. 2.2 Ideal gas processes: - Isobaric, Isochoric, Isothermal, Adiabatic, Polytropic, Isentropic with representation of the processes on P-V and T-S diagram (only simple numericals)	04	08
Chapter 3: Steam Boilers , Turbines and Condensers 3.1 Formation of steam - Properties of steam – Use of steam tables and charts, Steam power cycle (Rankine) 3.2 Modern features of high-pressure boilers – Mountings and accessories, Testing of boilers. 3.3 Steam turbines: Impulse and reaction principle – Velocity diagrams Compounding and governing methods of steam turbines (qualitative treatment only) - Layout and working principle of a steam power plant. 3.4 Steam condenser: Dalton's law of partial pressure, function and classification of condensers, construction and working of surface condensers. 3.5 Cooling Towers. Force draught, natural draught and induced draught.	10	20
Chapter 4: Compressors and Refrigeration 4.1 Positive displacement compressors , Reciprocating compressors, Indicated power, Clearance volume, Various efficiencies, Clearance ratio, Volume rate, Conditions for perfect and imperfect intercooling, Multi stage with intercooling, Rotary positive displacement compressors , Construction and working principle of centrifugal and axial flow compressors. 4.2 Refrigeration - Various methods of producing refrigerating effects (RE), Vapour compression cycle: P-H and T-S diagram , Saturation cycles - Effect of sub cooling and super heating (qualitative treatment only)	09	20
Chapter 5: I.C. Engines 5.1 Power Cycles - Carnot, Otto, Diesel, Dual, Brayton Cycle, representation on P-V, T-S diagram and Simple numerical on Otto cycle &diesel cycle. 5.2 Classification of I.C. Engines	10	20

5.3 Two stroke and four stroke Engines Construction and working, comparison, valve timing Diagram, Turning moment diagram 5.4 Brief description of I.C. Engine combustion (SI & CI), scavenging, Pre-ignition, detonation, supercharging, turbo charging, simple Carburetor, M.P.F.I., fuel injection pump 5.5 List of fuel, lubricant additives and their advantages.		
Chapter 6: Heat Transfer 6.1 Modes of heat transfer: - Conduction, convection and radiation. 6.2 Conduction by heat transfer Fourier's law, thermal conductivity, conduction through cylinder, thermal resistance, composite walls, combined conduction and convection (Simple numerical) 6.3 Heat transfer by Radiation: Thermal Radiation, Absorptivity, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Stefan-Boltzman law. 6.4 Heat Exchangers: Shell and tube, plate type, multiphase heat exchangers. Materials Used and applications of heat exchangers.	09	20
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skill:

1. Understand different sources of energy and their applications.
2. Understand various concepts and fundamentals of thermodynamics.
3. Understand concepts and laws of ideal gasses.
4. Understand vapour processes, steam boilers and different mountings and accessories.
5. Understand modes of heat transfer and concept of heat exchanges.
6. Interpret steam tables, mollier chart and relationship between different thermodynamic properties.

Motor Skills:

1. Conduct trial on the setup for calculation of thermal conductivity of metal rod
2. Trace path of flue gases and water steam circuit in a boiler.
3. Conduct trial on solar water heating system.

List of practical:

1. Trace the flue gas path and water-steam circuit with the help of boiler model and write a report.

2. Report on visit to sugar factory / Dairy / steam power plant with specifications of boiler and list of mountings and accessories.
3. Calculation of thermal conductivity of a solid metallic rod.
4. Verification of Stefan-Boltzman's law of thermal conductivity
5. Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc.
6. Collection and analysis of manufacturer's catalogue for compressors
7. Dismantling assembly of petrol/diesel engine.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Domkundwar V. M.	A Course in Thermal Engineering	Dhanpat Rai & Co.
02	P. L. Ballaney	A Course in Thermal Engineering	Khanna Publishers
03	R. S. Khurmi	A text book of Thermal Engineering.	S. Chand & co. Ltd.
04	P. K. Nag	Engineering Thermodynamics	Tata McGraw Hill
05	Patel and Karmchandani	Heat Engine Vol. - I & II	Acharya Publication

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Third

Subject Title : Basic Electrical and Electronics Engineering

Subject Code : 17353

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
04	--	02	03	100	25#	--	25@	150

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

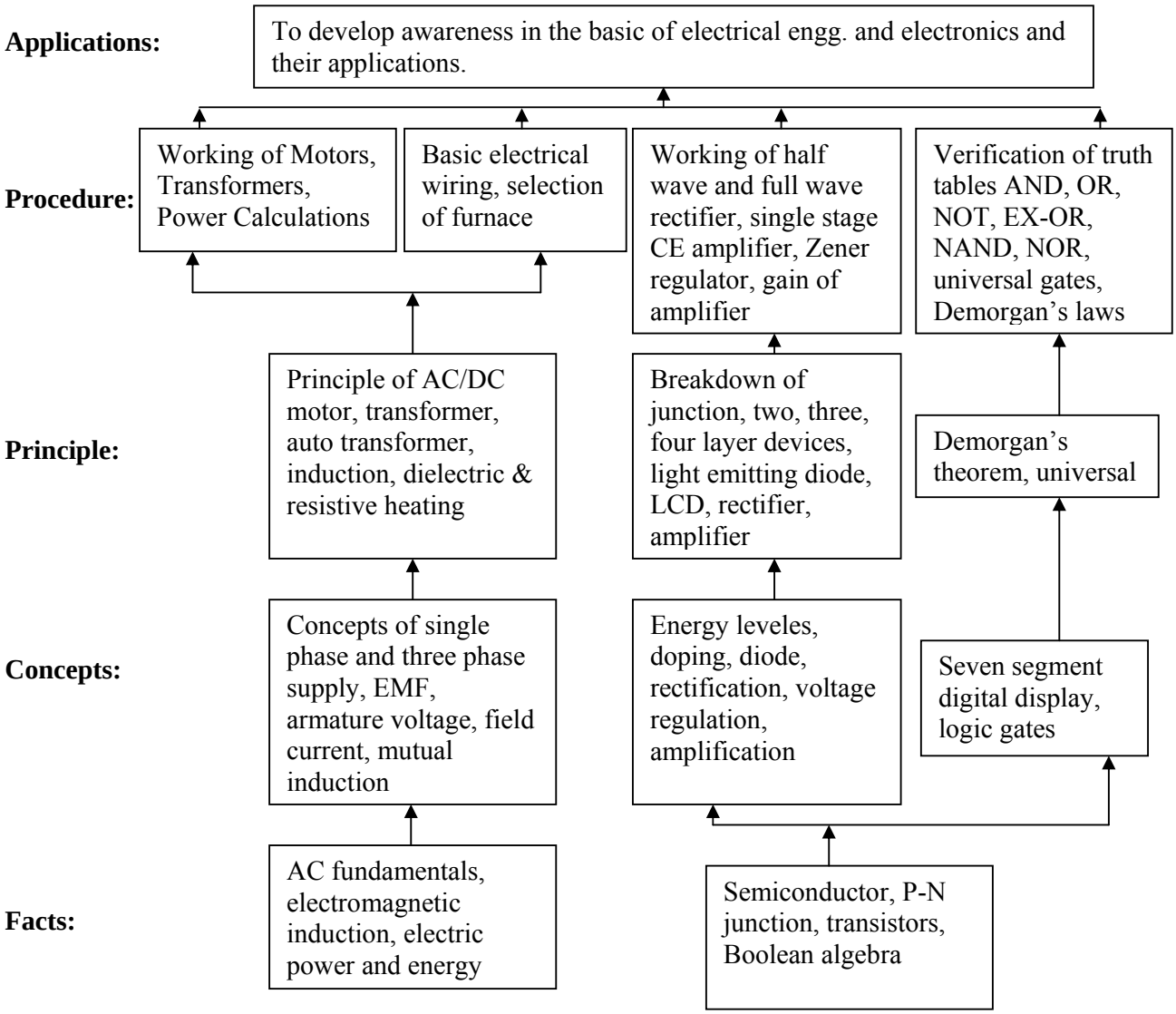
Most of the equipments used in Agriculture segment are electrically powered. A minor electrical faults can be attended by a shop floor agriculture engineer. This subject of electrical engg. addresses the fundamental concepts and operating principles of electrical appliances. It will enable the students in better handling and commissioning of the equipments.

The second section of the subject deals with the basic of semiconductor devices and their circuits necessary for the electronic control gadgets. It provides the information about logic gates, digital displays, small signal amplifiers and power supplies. This will help the students in building skills of effective handling of electronic control equipments.

General Objectives: Student will be able to develop:

- Awareness of Electrical Safety.
- Recognize Electrical fault in Chemical Plant.
- Recognize fault in power supply, display & control panel.
- Understand working of basic semiconductor devices.

Learning Structure:



Theory: Section - I Electrical Engineering

Topic/Content	Hours	Marks
1. Introduction To Electric Power System And A. C. Supply **Specific Objectives:** **Student will be able to :** ➢ Understand various components of power system. ➢ Distinguish between a.c. and d.c. supply. ➢ Calculate electrical quantities of a.c. supply and circuit parameters of R-L and R-C circuits. ➢ Calculate line and phase quantities and various powers in three phase circuit **Contents: Introduction:** 1.1 Electrical power supply system generation, transmission, distribution. AC supply & DC Supply Study of types of wiring accessories. **AC Fundamentals:** 1.2 Definitions; cycle, frequency, phase, period, maximum value, average value, r.m.s. value. **(Simple Numericals)** 1.3 Concept of current, voltage, power & energy in series R-L and R-C circuits.**(Simple Numericals)** **Three phase supply:** 1.4 Star and Delta circuit, 1.5 Line and Phase relationship, power equation. **(Simple Numericals)**	05	08
2. Measuring Instruments: **Specific Objectives:** **Student will be able to :** ➢ Understand ac and dc meters. ➢ Use multimeter for measurements of current, voltage and passive parameter. **Contents:** 2.1 Introduction to construction, operation and use of AC and DC ammeter, voltmeter (PMMC and MI meters only). 2.2 Electro-dynamic wattmeter, energy meter and digital multimeter, Clip on meter.	04	06
3.Transformer: **Specific Objectives:** **Student will be able to :** ➢ Understand working principle of transformer. ➢ Calculate transformation ratio, efficiency and regulation from direct load test. **Contents:** 3.1 Construction and principle of operation. 3.2 EMF equation and transformation ratio. 3.3 Load test for efficiency and regulation. Specifications and rating. 3.4 Auto transformer & 3 phase transformer concept only. 3.5 Applications of transformers.	06	10

4. Electric wiring , Illumination , Electric safety, **Tariff & Power conservation** : **Specific Objectives:** **Student will be able to :** ➢ Do wiring of switchboards. ➢ Select type of lamp as per requirement. ➢ Understand importance of MCB and ELCB and electric safety. ➢ Understand need of earthing and importance of pf. Improvement. **Contents:** 4.1 Introduction to switches used in mechanical machines. Simple Electric Installations with 2 sockets,2 fans, 2 lamps, with switches and fuses 4.2 Introduction to different accessories like MCB, ELCB, wires & cables. 4.3 Different types of lamps with their ratings and applications. 4.4 Concept of energy conservation and energy audit 4.5 Necessity of earthing, type, safety tools, first aid. 4.6 Types of tariff, pf improvement only methods. 4.7 Fire extinguishing methods adopted in electrical engineering 4.8 Trouble shooting electrical installations and machines.	08	10
5. **AC Motor:** **Specific Objectives:** **Student will be able to :** ➢ Describe working principle of three phase induction motor. ➢ Calculate slip and rotor frequency and draw speed-torque curves. ➢ Use starter for three phase induction motor. ➢ Understand working principle of single phase induction motor and its types. ➢ Select proper type of single phase induction motor. **Contents:** **5.1 Three Phase Induction Motor**: ➢ Construction and principle of operation of 3 phase induction motor. ➢ Starters-Direct ON Line Starters and Star-Delta Starters-Working principle, circuit diagram and applications. **5.2 Single phase induction motors:** Working Principle and Applications a) Capacitor start, b) Capacitor start and run, c) Shaded pole	04	08

6. Utilization of Electrical Energy: 18 Marks Specific Objectives: **Student will be able to :** ➢ Classify and select electric drives on the basis of speed-torque characteristics and enclosures. ➢ Understand working principle of electric heating, welding and electroplating. ➢ Use electric motor for electro-agro system. **Contents:** **6.1 Industrial applications:** ➢ Classification of drives ➢ Factors for selection of motor for different drives. ➢ Types of enclosures. **6.2 Electric welding:** Working principle & types of welding and their applications. **6.3 Electrometallurgical & Electro Agro Systems:** Concept and principle used in electroplating. ➢ Electrical machines used in agro systems.	05	08
Total	32	50

Section – II Electronics

Topic and Contents	Hours	Marks
1: Semiconductor Electronic Devices Specific Objectives: ➢ Draw V-I characteristics of different devices. ➢ State the symbols of different components. Contents: 1.1 **Descreat Components:**---------- 12 **Marks** • Resistor, inductor, capacitor - definition, symbols & applications. • Conductors, semiconductors, Insulators – definition, energy band diagram, examples. • Semiconductors classification – Intrinsic and Extrinsic – N type & P type, definition, charge carrier. • PN junction diode – construction, symbol, working, forward & reverse bias V-I characteristic, applications. • Light emitting diode – Construction, symbol, working principle, applications. • Junction breakdown. • Zener diode - Construction, symbol, working principle, reverse bias V-I characteristic, applications. **1.2 Power devices – 08 Marks** SCR - Construction, symbol, working principle, Applications. TRIAC - Construction, symbol, working principle, Applications.	12	20

2: Bipolar Junction Transistor Specific Objectives: ➢ Draw output characteristics of CE configuration. ➢ Describe working of transistor amplifier. Contents: • BJT types – NPN & PNP , their symbols & construction, • Working of a NPN transistor. • Transistor characteristics – Common emitter configuration. • Single stage CE amplifier – circuit diagram & working. • Power amplifier – Concept & types. • Applications of transistor.	06	08
3: Power Supply Specific Objectives: ➢ Draw block diagram of power supply. ➢ Describe working of different rectifier circuits. Contents: • Power supply – Necessity, block diagram. • Rectifier – Types, Half wave, Full wave (center tapped & bridge type) – Circuit diagram, working, waveforms & their comparison. • Filter – Need & types – shunt capacitor, series inductor, LC & π type, circuit diagram. • Voltage regulator – Need, principle of zener shunt regulator.	07	12
4: Digital Circuits Specific Objectives: ➢ State symbols of different logic gates. ➢ Use NAND / NOR gate as universal gates. Contents: • Digital signal, Negative & positive logic. • Boolean algebra. • Logic gates – AND, OR, NOT, NAND, NOR, EX-OR ,symbols, logic expressions ,truth table. • De- Morgan,s theorems – statement, proof using truth table. • Universal gates – definition, NAND, NOR. Digital display – Types of LED & LCD display	07	10
Total	**32**	**50**

Practical:

Section I: Electrical Engineering:

Skills to be developed:

Intellectual skills:

1. Identify and give specifications of electrical motors and transformers.
2. Interpret wiring diagrams for various applications.
3. Identify safety equipments required.

Motor skills:

1. Draw wiring diagram
2. Make wiring connections to connect electrical equipments and instruments.
3. Measure electrical power, earth resistance and other electrical quantities.
5. Use of safety devices while working.

Section II: Electronics Engineering

Intellectual Skills:

1. Identification and selection of components.
2. Interpretation of circuits and signals

Motor Skills:

- Use various tools and components for different electrical applications.
- Handle various electronic test and measuring equipments.

List of Practicals:

Section-I

1. To measure current, power and p.f of series R-L and R-C circuit.
2. To measure line and phase quantities(currents and voltages) in a given 3 phase load (lamp bank or 3–phase motor) by connecting it in a) star and b) delta
3. To conduct load test at full load on single phase 1 kVA, 230/115 V, 50 Hz transformer for determining efficiency and regulation.
4. To measure slip of three phase induction motor by use of tachometer at no load and full load.
5. To reverse the direction of 3 –phase induction motor by changing phase sequence.
6. To prepare switchboard for two lamps, one fan and one 5A socket.

Section-II

1) To operate the various laboratory equipments & measuring instruments like power Supply, CRO, DMM
2) To plot forward & reverse characteristics of Silicon Diode.
3) To measure percentage line regulation of Shunt Zener regulator.
4) To measure voltage gain of single stage common Emitter amplifier at 1 khz.
5) To verify the truth tables of various logic gates.
6) To verify De - Morgan' s First theorem.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
1	N. N. Bhargava, S. C. Gupta	Basic Electronics & LinearN.N. Bhargava, Technical Teachers Circuits	Technical Teachers Training Institute
2	B. L. Theraja	Basic Electronics (Solid State)	S. Chand & Company Ltd.
3	R.P. Jain	Modern Digital Electronics	Tata McGraw Hill, Delhi.
4	B. D. Arora	Electrical wiring & Estimation Costing	R.B. Publications

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Third

Subject Title : Computer Applications in Agriculture Engineering

Subject Code : 17033

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	50#	--	25@	75

Rationale:

Computers and their applications changed the face of most traditional occupations including agriculture. From computerized milk collection and seed estimators to weather predictions and automated farmland assessment, computers have revolutionized farming practices.

General Objectives:

Intellectual Skills:

1. Present information in efficient manner
2. Create static web pages
3. Use of database queries

Motor Skills:

1. Use the key board and mouse efficiently
2. Use the available software to develop a good presentable document

Content:

Note: Contents of theory should be taught in practical period with the help of LCD projector.

Activity
Presentation Software 1.1 Use of Menus for preparing a presentation 1.2 Applying design templates 1.3 Applying animation effects to the presentation 1.4 Applying sound to presentation slides 1.5 Use of video clips in presentation 1.6 Use of chart wizard Activity 1. To create a presentation using Presentation Software and apply various design templates 2. To add animation effects and sound to the presentation
Web Page Design Theory 2.1 Terminologies used in Web Design 2.2 Components of HTML 2.3 Structure Tags 2.4 Block Level Elements 2.5 Text Level Elements Activity 1. Design a web page and apply text level and block level tags Theory Hyperlinking documents and images Activity 2. Design web pages and apply hyperlinking Theory Use of images in a web page Activity 3. Design a web page to include images with different alignments and wrapped text in web page, also include image as link in a web page. Theory Designing forms on web page including various controls like button, textbox, password fields, checkbox etc. Also using tables for displaying forms. Activity 4. To create a basic form using form controls 5. To design a web page containing table
Database Theory 3.1 Introduction to database and its applications in various fields 3.2 Creating database table, entering data, update and delete records 3.3 Creating a form 3.4 using database queries 3.5 generating reports Activity 1. To create database in Microsoft Access, to create tables, to Insert, update and delete records 2. To apply SQL queries to database to insert, update and delete data and display records 3. Designing form using Microsoft Access and generate report
Internet Activity

1. To search information on a particular topic over Internet and prepare a technical report 2. Study of Internet security basics
Case studies Case studies based on recent e-agriculture applications, applications of mobile technology in agriculture, applications of computer in modernization of agriculture (any two)
Visit Report Activity 1. Plan and Visit any agriculture based industry (e.g. Dairy, Agriculture equipment manufacturing industry) and prepare a visit report to study the applications of computers in modernization of industry.

Learning Resources:
Books:

Sr. No.	Title	Author
1.	HTML Black Book	Steven Holzner
2.	HTML Complete Reference	Thomas A. Powell
3.	Microsoft Access 2010 Bible	Michael R. Groh

Web Links:

1. www.w3schools.com/html
2. www.html.net
3. www.e-agriculture.org

Equipment List/ Tools:
Hardware Tools:

1. Computer System (Pentium-IV or Higher Version).
2. LCD Projector.

Software Tool:

1. Microsoft Power point
2. Microsoft Access

Course Name : Diploma in Agriculture Engineering

Course Code : AU

Semester : Third

Subject Title : Professional Practice-I

Subject Code : 17034

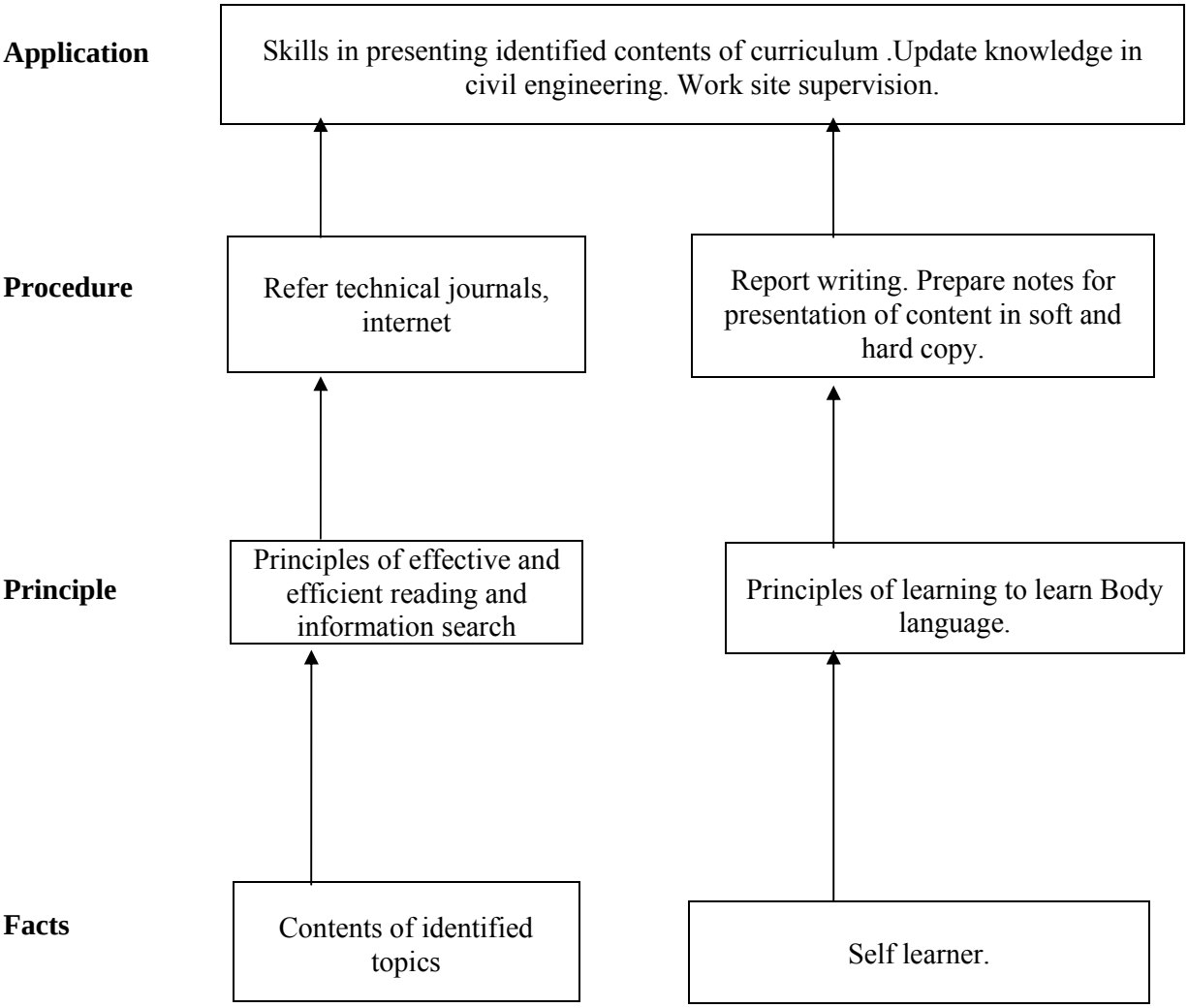
Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	100

Rationale:

Students are provided the opportunity to learn different subjects which encourages development of related intellectual and motor skills amongst them. These skills are further to be incorporated with various activities in the work environment. This is aspect is introduced through this subject. Students are expected to have updated knowledge, current developments in industries and innovations in the field of Agricultural Engineering. Students' participation in the above mentioned curriculum activities will enhance his/her confidence, attitude, communication skills. The exposure to industries, interaction with experts in agricultural engineering field will enable a learner to improve upon his own personal abilities and will help in decision making ability. Field visits will give an opportunity to the student to experience the actual working conditions in the industry, visualize the use of various materials, equipments & processes involved in execution of work. Preparing and delivering seminar by students will lead them to acquire communication skills, express views and technical knowledge, answer queries, develop presentation skills. Data collection involves visiting to markets, material suppliers, industries, manufacturers, etc. by way of which students learn data collection techniques, actual data collection, analysis and presentation of it. This shall be helpful to them when they work in industries or become entrepreneurs.

Learning Structure:



Objectives:
To develop the following skills:

Intellectual Skills:

1. Understand applications of agricultural engineering concepts, latest technologies at the visit sites.
2. Listening and grasping the views of experts.
3. Literature survey, access internet for seminar topic preparation.
4. Asking questions & taking interviews while collecting data.

Motor Skills:

1. Report writing
2. Power point presentation
3. Feedback report on guest lectures
4. Organizing and structuring information

List of Practicals:

Activity	Name of the Activity
1	**Field Visits:** Structured field visits (minimum two) be arranged and report of the same should be submitted by the individual student, to form a part of the term work. The field visits may be arranged in the following areas / industries: i) Visit to agricultural Equipment manufacturing industry ii) Visit meteorology observatory iii) Visit a dam to understand the flood routing, flood control mechanisms iv) Visit Agriculture farms to study types pf wells, ground water resources OR Similar visits
2	**Lectures by Professional / Industrial Expert to be organized from of the following areas (any two)** i) Latest techniques and equipment/gauges etc. use for rainfall measurements ii) Software used in Agricultural Engineering and their applications iii) Recent trends in Hydrography iv) Use of electronics in development of efficient agricultural machines and instruments v) Personality development vi) Equipments / Machinery involved in earthwork.
3	**Seminar:** Any one seminar on the topics suggested below: Students (Group of 4 to 5 students) has to search / collect information about the topic through literature survey, visits and discussions with Experts / concerned persons: Students will have to submit a report of about 10 pages and deliver a seminar for 10 minutes on topics like- i) Problems of drinking water in rural area ii) Comparative study of soils iii) Study of methods of water conservation in rural area iv) Study of soils and cropping patterns OR Similar topics
4	**Market Survey:** A group of four students is expected to collect information from the market regarding various pipes and jointing accessories available made from PVC, Cast Iron, Mild steel, HDPE etc. Various types of farming implements

Assignments for Term work to be done by students:

1) Write report on Field visit no 1.
2) Write report on Field visit no 2.
3) Write your views on the guest lecturer no 1 with subject matter on its topic.
4) Write your views on the guest lecturer no 2 with subject matter on it its topic.
5) Seminar topic - hard copy.
6) Seminar topic - Soft copy.
7) Market survey information collected & its analysis if any.

Websites: on Google search refers various websites related to:

1) How to write report
2) How to prepare for seminar
3) Effective Listening

e.g. http://www.lboro.ac.uk/service/ltd/campus/reportwr.pdf
http://unilearning.uow.edu.au/report/5b.html