<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Details</th>
<th>Theory</th>
<th>No of Periods Per Week</th>
<th>Full Marks</th>
<th>No of Period in one session : 60</th>
<th>Annual Exam.</th>
<th>Internal Exam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>00201</td>
<td>PROFESSIONAL MATHEMATICS</td>
<td></td>
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</tr>
</tbody>
</table>

### CONTENTS:

**GROUP-A**

**NUMERICAL METHODS & COMPUTATIONAL TECHNIQUES**

- **01.01** Introduction to Numerical methods: Approximation and errors (Truncation & Round off). Floating, point presentation of numbers, arithmetic operations with normalized floating point.
- **01.03** Solution of Linear Simultaneous Equations: Gaussian Elimination method and Gauss-Jordan method.
- **01.05** Numerical Differentiation & Integration: Newton’s forward and backward differentiation formula. Trapezoidal Rule and Simpson’s 1/3 rule for numerical integration.
- **01.06** Numerical solution of 1st order ordinary differential equations: Taylor’s Series. Euler’s method. Modified Euler’s method Runge-Kutta methods.

**GROUP-B**

**STATISTICAL TECHNIQUES**

- **02.01** Introduction to statistics: Measure of central tendencies: measures of dispersions: standard deviation and variance for discrete and grouped data: assumed mean and step deviation methods.
- **02.03** Probability Distribution: Introduction to Arithmetic Mean and Standard Deviation of a probability distribution. Important probability distribution – Binomial distribution. Poisson’s distribution and normal distribution. Their means and variance.
- **02.04** Sampling Distribution: Sampling Distribution of Mean and Standard Deviation.
- **02.05** Quality Control: P-Chart and R-Chart.

**GROUP-C**

**MANAGEMENT TECHNIQUES**

- **03.01** Linear Models
- **03.01.01** Introduction to Operations Research (O.R) Steps of O.R.
- **03.01.02** Linear Programming Problems: Step in information of a LPP. Mathematical Modelling and Solution Procedure.
- **03.01.03** Solution by Simplex Method: Basic Feasible Solution (Degenerator and Non-degenerator) Procedure including Big-M Method. Example.
- **03.01.04** Transportation problem: Introduction and Solution Procedure:
  - (i) Finding the initial basic feasible solution by N-W Corner Rule and Vogel’s Approximation Method.
  - (ii) Finding the Optimal Solution by U-V Method.
- **03.01.05** Assignment Problem: Introduction and Solution Procedure – Fundamental theory underlying Hungarian Method.
- **03.02** Network Analysis. CPM & PERT: Introduction.
- **03.02.01** Basic concepts – Activities. Nodes. Edges. Networking of a project. Various times calculations. CPM to determine the optimal project schedule.
- **03.02.02** PERT- Definition, difference between CPM & PERT. Pessimistic times, optimistic times. Most likely times of various activities, probability of meeting the schedule time, standard deviation of the schedule time.
- **03.03** Simulation: Event type simulation – elements of simulation, Generation of random numbers. Monte Carlo simulation – Generation and analysis of random observation using random numbers.

### Books Recommended:

- **Text Books**

### Scheme of Examination for Final Examination

- **F.M. : 80**
ENGINEERING MECHANICS

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Theory</th>
<th>No of Period in one session : 50</th>
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</thead>
<tbody>
<tr>
<td>00202</td>
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</table>

Rationale:
The subject forms an important part of Engineering curricula for developing the concepts required in the design of various structures. The subject deals with the basic concept of mechanic of body and the behaviour of material used in practice and in structures under varying load conditions. The first part of the subject deals with the applied mechanics science. Which describe the condition of body in rest or motion under the action of forces. In its preview come variety of general and specialized engineering disciplines concerned with analysis of structures and machines and the mechanism of their parts.

In the Second part, the principles of strength of materials is introduced in which the student will learn to distinguish between different types of stress and strain and also the qualitative assessment of stress and strains in material element under the action of internal forces.

Objective:
Knowledge Workers will be able to:
- Analyze and understand the physical behaviour of members of engineering structures.
- Acquire knowledge of various elements of structures.
- Utilise the basic principles.
- Develop skill to tackle field problem.
- Solve the problems by the application of basic principles.
- Judge the suitability of materials in design process.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>PART-A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Periods</td>
</tr>
<tr>
<td>01</td>
<td>Introduction</td>
<td>(02)</td>
</tr>
<tr>
<td>02</td>
<td>Vector Methods</td>
<td>(02)</td>
</tr>
<tr>
<td>03</td>
<td>Introduction to system of forces and equilibrium</td>
<td>(06)</td>
</tr>
<tr>
<td>04</td>
<td>Friction</td>
<td>(04)</td>
</tr>
<tr>
<td>05</td>
<td>Kinematics and kinetics of a particle</td>
<td>(03)</td>
</tr>
<tr>
<td>06</td>
<td>Kinematics and kinetics of rigid body</td>
<td>(04)</td>
</tr>
<tr>
<td>07</td>
<td>Impulse and Momentum</td>
<td>(02)</td>
</tr>
<tr>
<td>08</td>
<td>Work, Energy and Power</td>
<td>(04)</td>
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<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>(27)</strong></td>
</tr>
</tbody>
</table>

PART-B

| 01    | Simple stress and strains                        | (05)   |
| 02    | Elastic constants                                | (03)   |
| 03    | Center of Gravity (Centroid)                    | (05)   |
| 04    | Moment of Inertia                                | (05)   |
| 05    | Shearing force and bending moments               |        |
|       | **Total:**                                        | **(23)** |

PART-B

CONTENTS:

PART-A

TOPIC: 01 – INTRODUCTION:
Idealisation of mechanics; Concept of rigid body; External forces (Body forces & surface forces) Law of Mechanics.

TOPIC: 02 VECTOR METHODS:
Equality and equivalence of vectors; Free and Bound vector; Moment of a force about a point and a line; Couple and moment of a couple; couple moment as free vector. Wrench.

TOPIC: 03 – INTRODUCTION TO SYSTEM OF FORCES AND EQUILIBRIUM:
Statically equivalent force system; simplest equivalent of a system of forces; force analysis, free body diagram, equation of equilibrium.

TOPIC: 04 – FRICTION:
Types of Friction (Static, Dynamic, Sliding, Rolling, Fluid) Rope & Belt Friction etc.

TOPIC: 05 – KINEMATICS AND KINETICS OF A PARTICLE:
Rectilinear and curvilinear translations; normal and tangential component of acceleration; radial and transverse component of acceleration.

TOPIC: 06 – KINEMATICS AND KINETICS OF RIGID BODY:
Angular velocity and angular acceleration. Effective forces on a rigid body. D’Alembert’s principle.

TOPIC: 07 – IMPULSE AND MOMENTUM:
Linear impulse and linear momentum, angular impulse and angular momentum.

TOPIC: 08 – WORK, ENERGY AND POWER:
Work done by forces and couples, potential and kinetic energy; work-energy; conservation of energy; concept of power and efficiency.

PART-B

TOPIC: 01 – SIMPLE STRESSES & STRAIN:
Definition of various terms and their units (S.I. Units)
Stress & strain in varying sectional bar & composite bar. Stress & strain due to temperature variation in homogeneous and composite bars.

TOPIC: 02 – ELASTIC STRESSES & STRAIN:

---
02.01 Linear strain and lateral strain, poisson’s ratio, volumetric strain
02.02 Change in volume due to axial, biaxial & triaxial loading. Bulk modulus.
02.03 Shear stress and strain, modulus of rigidity.
02.04 Various relations between modulus of elasticity, modulus of rigidity & bulk modulus.
02.05 Simple shear. Complementary shear stress, stress on oblique section.

TOPIC: 03 – CENTER OF GRAVITY (CENTROID):
03.01 Definition of center of gravity & centroid.
03.02 Determination of C.G of various sections symmetrical and unsymmetrical sections.
03.03 Determination of C.G of perforated sections. C.G. of semi circle, quadrant circle.

TOPIC: 04 – MOMENT OF INERTIA:
04.01 Definition of M.I.; radius of gyration, second moment of area.
04.02 Parallel axis theorem & perpendicular axis theorem.
04.03 Derivation of M.I. of regular area-rectangular, triangular circular about centroidal axis.
04.04 M.I. of built up section, symmetrical and unsymmetrical about centroidal axis, modulus of sections.

TOPIC: 05 – SHEARING FORCE & BENDING MOMENT:
05.01 Types of beams and types of supports, types of loading.
05.02 Concept and definitions of shear force and bending moment, sign convention.
05.03 Shear force and bending moment diagrams for cantilever, simply supported beam, over hanging beam for various types of loading & couples, point of contraflexure.
05.04 Relation between B.M, S.F. and rate of loading.

Books Recommended:

Text Books

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SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
Rationale: Computers play a vital role in present day life, more so, in the professional life of technician engineers. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various engineering applications of computers.

Objective: The objectives of this course are to make the students able to:

- Develop efficient algorithms for solving a problem.
- Use the various constructs of a programming language viz. conditional, iteration and recursion.
- Implement the algorithms in “C” language.
- Use simple data structures like arrays, stacks and linked list solving problems.
- Handling File in “C”.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Introduction to Programming</td>
<td>(03)</td>
</tr>
<tr>
<td>02</td>
<td>Algorithm for Problem Solving</td>
<td>(08)</td>
</tr>
<tr>
<td>03</td>
<td>Introduction to ‘C’ Language</td>
<td>(06)</td>
</tr>
<tr>
<td>04</td>
<td>Condition and Loops</td>
<td>(06)</td>
</tr>
<tr>
<td>05</td>
<td>Arrays</td>
<td>(06)</td>
</tr>
<tr>
<td>06</td>
<td>Functions</td>
<td>(05)</td>
</tr>
<tr>
<td>07</td>
<td>Structures and Unions</td>
<td>(05)</td>
</tr>
<tr>
<td>08</td>
<td>Pointers</td>
<td>(05)</td>
</tr>
<tr>
<td>09</td>
<td>Self Referential Structures and Linked Lists</td>
<td>(03)</td>
</tr>
<tr>
<td>10</td>
<td>File Processing</td>
<td>(03)</td>
</tr>
</tbody>
</table>

Total : (50)

CONTENTS:

**TOPIC: 01 – INTRODUCTION TO PROGRAMMING:**

**TOPIC: 02 – ALGORITHM FOR PROBLEM SOLVING:**
Exchanging values of two variables, summation of a set of numbers. Decimal Base to Binary Base conversion. Reversing digits of an integer, GCD (Greatest Common Division) of two numbers. Test whether a number is prime. Organize numbers in ascending order. Find square root of a number, factorial computation, Fibonacci sequence. Evaluate ‘sin x’ as sum of a series. Compute sine Series. Check whether a given number is Palindrome or not. Find Square root of a quadratic equation. Generate LCM & GCD. Reverse order of elements of an array. Find largest number in an array. Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial.

**TOPIC: 03 – INTRODUCTION TO ‘C’ LANGUAGE:**

- 03.01 Character set, Variable and Identifiers, Built-in Data Types, Variable Definition, Declaration, C Key Words-Rules & Guidelines for Naming Variables.
- 03.02 Arithmetic operators and Expressions, Constants and Literals, Precedence & Order of Evaluation.
- 03.03 Simple assignment statement. Basic input/output statement.
- 03.04 Simple ‘C’ programs.

**TOPIC: 04 – CONDITIONAL STATEMENTS AND LOOPS:**

- 04.01 Decision making within a program
- 04.02 Conditions, Relational Operators, Logical Perator.
- 04.03 If statement, it-else statement.
- 04.04 Loop statements
- 04.05 Break, Continue, Switch, Goto and Labels.

**TOPIC: 05 – ARRAYS:**
What is an Array?, Declaring an Array, Initializing an Array. One dimensional arrays: Array manipulation: Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Representation sparse matrices.

**TOPIC: 06 – FUNCTIONS:**
Top-down approach of problem solving. Modular programming and functions, Definition of Functions Recursion, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference; call by value, Recursive Functions, arrays as function arguments.

**TOPIC: 07 – STRUCTURES AND UNIONS:**

**TOPIC: 08 – POINTERS:**
Concept of Pointers, Address operators, pointer type declaration, pointer assignment, pointer initialization pointer arithmetic, Indirection Operator, Pointers to Pointers, functions and pointers, Arrays and Pointers, pointer arrays.
TOPIC: 09 – SELF REFERENTIAL STRUCTURES AND LINKED LISTS:
Creation of a singly linked list, Traversing a linked list, Insertion into a link list, Deletion from a linked list.

TOPIC: 10 – FILE PROCESSING:
Concept of Files, File operation in various modes and closing of a file, Reading from file, Writing onto a file.

Book Recommended:


SCHEME OF EXAMINATION FOR FINAL EXAMINATION
F.M. : 80
Rationale:
Drawing is the language of engineers. Without the knowledge and skill of drawing an Agricultural Engineering Diploma Holder becomes handicapped in understanding the problems right from design state of machine components to the production. This subject will develop the understanding of drawing, representation of machine parts. The subject will help a technician in understanding the functioning of different machine, which will help in maintenance, dismantling and assembly of machines used in agricultural farms, food processing, production process etc. This subject will develop the skill of communication through drawing which in turn will develop confidence.

Objective:
The students will be able to:
- Understand screw threads and its characteristics representation
- Understand the fastening types and its representation
- Understand the different types of joints used and its representation can get the ability to understand the different types of power coupling used in farm machinery and its representation
- Can develop the ability to represent the agricultural machine parts, machining components by free hand sketch
- Develop overall drawing and drafting skill in practical fields.

CONTENTS:
01 Scales, their use and lettering techniques.
02 Free hand single stroke lettering in upright (vertical) and inclined, capital and numerals.
03 Orthographic Projection.
04 Method of projection, 1st angle and 3rd angle projection.
05 Orthographic projection of simple models and from given isometric drawing of simple blocks and machine parts.
06 Isometric and oblique drawing.
07 Introduction of pictorial, drawing, construction of isometric scale, its use in isometric drawing.
08 Isometric drawing and oblique of simple blocks and m/c parts.
09 Conventions used in Machine Drawing.
10 Conventional representation of common features in mechanical drawing like screw threads, rolled sections bearings tension spring, gear and penion as per Is:696
11 Conventional representation of materials on per Is:696
12 Conventional method of representation of full sectional and half sectional views of m/c parts as per Is:696
14 Freehand sketches of the following muff and universal couplings.
15 Different joints like socket and spigot joints, union joints, expansion joint, bush bearings.
16 Loose and fast, pulley.
17 Dimensional and sectional drawing of bearing – pedestal bearing, plummer block, foot step bearing.
   Machine parts – cotter joint, knuckle joint.

Books Recommended:

SCHEME OF EXAMINATION FOR FINAL EXAMINATION
F.M. : 80
The knowledge of fluid characteristics of head due to sudden change of fluid pressure at a point, pressure head, transmissibility of liquid pressure, Bramah's process or hydraulic press, measurement of pressure due to pipe friction, Darcy-Weisbach formula, buoyancy and floatation, kinetic energy, internal exam.

Flow through open channels orifices, hydro-kinematics, head, buoyancy and floatation, surface properties, hydrostatic pressure on surfaces, anicut raised weir, arbarrage, broad crested weir, egee weir, separating weir.

Topics include inclined laminae, flow through orifices and mouth pieces.

Hydro-kinematics – head, stable, unstable, number of periods in one session: 50.

Dynamics of fluid flow – useful in project planning and execution work.

Properties of fluids – full marks.

Flow through pipes – annulus, orifice plate.

Flow through orifices and mouth pieces.

Hydrostatic pressure on surfaces – total pressure on a lamina immersed in a liquid, center of pressure, the hydrostatic paradox, pressure force on vertical and inclined laminae, pressure on curved surfaces, pressure on lock gates, pressures on a masonry dam, stability of dam, minimum bottom with required for a dam.

Buoyancy and floatation – Archimedes principle, center of buoyancy, body immersed in two different fluids, Meta centre, Metacentric height, stable, unstable and neutral equilibrium.

Hydrodynamics – introduction, method of describing fluid motion, streamline, path line, streak line, stream tube, potential line, types of flow, laminar & turbulent, steady & unsteady flow, uniform and non-uniform flow, rotational and irrotational flow, various types of fluid movements.

Energy possessed by fluid body potential energy and potential head, pressure energy and pressure head, kinetic energy and kinetic head, the energy equation, Bernoulli's theorem, Euler's equation of motion, inter conversion of potential pressure and kinetic heads, kinetic energy correction factor, momentum equation, rate of change of momentum, central volume, the venturimeter, the venturi head, pitot tube, the manometer.

Orifices, small and large orifices, circular & rectangular orifices, sharp edge and bell mouthed orifices, Vena contracta, coefficient of orifices, coefficient of contraction, coefficient of velocity and coefficient of discharge, submerged orifice, large orifice, loss of head due to sudden enlargement, loss of head due to sudden contraction, mouth piece, convergent, divergent mouth piece.

Difference between notch and weir, Nappe or vein, crest or sill of a notch, classification of weirs, rectangular weir, triangular weir, trapezoidal weir, weir with end contraction.

Submerged weir – Anicut raised weir, arbarbage, broad crested weir, egee weir, separating weir.

Laws of fluid friction, loss of head due to pipe friction, Darcy-Weir back formula, Hydraulic gradient, Total energy line, pipes in series, pipes in parallel, Dupuits equation, loss of head in tapering pipe with nozzle.

Types of channels: Rectangular, trapezoidal and circular channels; Opened covered channels, steady and unsteady flow in a channel. Chezy's formula, Kuttur's formula, Manning formula, Hydraulic mean depth or radius, Most efficient section, Specific energy head, Critical depth, critical velocity, Hydraulic jump or standing wave. Condition on which the hydraulic jump will occur. Back water curve, Channel with mild, steep, critical slope.
TOPIC: 11 – PUMPS:
Pumps and its types, Centrifugal pump, method of converting the kinetic energy of water leaving the impeller into pressure energy, the volute chamber, the vertex or the whirlpool chamber, guideblades minimum speed to start the pump, loss of head due to reduced or increased flow.
Principles of similarity applied to centrifugal pumps. Characteristics curves.
Working of Reciprocating pump, Single and double action reciprocating pump with air vessels.
The propeller pump or flow pump, the jet pump, the air lift pump, the vane type pump, gear wheel pump, the pershion wheel, the archimedes screw pump, submersible pump. Comparison between centrifugal & reciprocating pump.

Books Recommended:

1. Fluid Mechanics & Hydraulics - Dr. Jagdish Lal
   Metropolitan Book Co. Pvt. Ltd., New Delhi
2. Hydraulics Fluid Mechanics & Fluid Machines - S. Ramanruthan
   S. Chand & Co., Ram Nagar, New Delhi
4. A Text Book of Fluid Mechanics & Hydraulics - R.K. Bansal
   Laxmi Publication, New Delhi
5. Tube Well & Pumps - Dr. A.M. Michel
   Water Technology Centre, ICAR, New Delhi
6. Open Channel Flow - V.T. Chaw
   Mc Graw Hill Co.

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
SOIL SCIENCE AND SOIL MECHANICS

Rationale:
Soil serves as the natural media for plant growth. The maintenance of Soil fertility is essential to cater the food needs for ever increasing population. It is essential for a diploma student to know about the modern scientific knowledge about physical and chemical properties of soil.

Objective:
The course is designed with following objectives:
- to know about soil and soil formation
- to know about physical properties of soil
- to know about soil constituents
- to know about problem soils and principles of their management
- to develop knowledge about engineering properties of soil

S.No. | Topics                                                                 | Periods |
---   | ------------------------------------------------------------------------------------------------------------------------ | ------ |
GROUP A (SOIL SCIENCE)                                                                                     |
01    | Soil and Soil formation                                                                                                   | (04)   |
02    | Soil constituents                                                                                                          | (04)   |
03    | Physical properties of soil                                                                                               | (10)   |
04    | Soil Micro organism                                                                                                        | (04)   |
05    | Essential plant nutrients                                                                                                 | (04)   |
06    | Problem Soils                                                                                                              | (06)   |
GROUP B (SOIL MECHANICS)                                                                                      |
07    | Basic Definitions                                                                                                          | (02)   |
08    | Grain size distribution                                                                                                    | (02)   |
09    | Atterburg’s limits                                                                                                         | (02)   |
10    | Classification of soils                                                                                                    | (03)   |
11    | Soil permeability                                                                                                          | (03)   |
12    | Soil Compaction                                                                                                            | (03)   |
13    | Bearing Capacity of Soil                                                                                                   | (03)   |
CONTENTS:
GROUP A (SOIL SCIENCE)

TOPIC: 01 – SOIL AND SOIL FORMATION:                                                                                     [04]
01.01 | Rocks                                                                                                                   |        |
01.02 | Weathering of rocks                                                                                                       |        |
01.02.01 | Physical weathering                                                                                                       |        |
01.02.02 | Chemical weathering                                                                                                       |        |
01.02.03 | Biological weathering                                                                                                     |        |

TOPIC: 02 – SOIL CONSTITUENTS:                                                                                           [04]
02.01 | Components of soil                                                                                                        |        |
02.01.01 | Mineral matter                                                                                                             |        |
02.01.02 | Organic matter                                                                                                             |        |
02.01.03 | Soil water                                                                                                                 |        |
02.01.04 | Soil air                                                                                                                   |        |

TOPIC: 03 – PHYSICAL PROPERTIES OF SOIL:                                                                                   [10]
03.01 | Soil texture                                                                                                               |        |
03.01.01 | Soil texture in relation to soil classification                                                                           |        |
03.01.02 | Effect of soil texture on crop production                                                                               |        |
03.02 | Soil structure                                                                                                             |        |
03.02.01 | Factors affecting soil structure                                                                                           |        |
03.02.02 | Types of soil structure                                                                                                   |        |
03.02.03 | Effect of soil structure on other physical properties of soil                                                            |        |
03.03 | Soil temperature                                                                                                          |        |
03.03.01 | Importance of soil temperature                                                                                             |        |
03.03.02 | Factors affecting soil temperature                                                                                         |        |
03.03.03 | Control of soil temperature                                                                                               |        |
03.04 | Soil porosity                                                                                                             |        |
03.04.01 | Factor affecting soil porosity                                                                                             |        |
03.04.02 | Importance of pore-space in Agriculture                                                                                  |        |
03.05 | Soil colour                                                                                                               |        |
03.05.01 | Colour producing compounds in soil                                                                                        |        |
03.05.02 | Importance of soil colour in agriculture                                                                                  |        |
03.06 | Soil density                                                                                                              |        |
TOPIC: 04 – SOIL MICRO ORGANISM:
04.01 Classification of soil micro organism
04.02 Beneficial function of soil micro organism
04.03 Harmful effect of soil microorganism

TOPIC: 05 – ESSENTIAL PLANT NUTRIENTS:
05.01 Classification of nutrients
05.02 Role of nutrients
05.03 Deficiency symptoms of nutrients
05.04 Forms in which nutrients are taken in by plants
05.05 Sources of plant nutrients in the soil

TOPIC: 06 – PROBLEM SOILS:
06.01 Acid soils and their management
06.02 Saline soils and their management
06.03 Alkali soils and their management

GROUP-B (SOIL MECHANICS)

TOPIC: 07 – BASIC DEFINITIONS:
07.01 Soil mass
07.02 Water content
07.03 Density or unit weight of soil solids
07.04 Specific gravity
07.05 Void ratio
07.06 Porosity
07.07 Degree of saturation

TOPIC: 08 – GRAIN SIZE DISTRIBUTION:
08.01 Sieve analysis
08.02 Stocke’s law and hydrometer analysis (Basic concept only)

TOPIC: 09 – ATTERBURG’S LIMITS:
09.01 Types of Atterburg’s limits
09.01.01 Methods of determination of liquid limit
09.01.02 Methods of determination of plastic limit

TOPIC: 10 – CLASSIFICATION OF SOILS:
10.01 Descriptive idea Grain size classification and Indian standard soil classification

TOPIC: 11 – SOIL PERMEABILITY:
11.01 Darcy’s law
11.02 Constant head permeameter
11.03 Variable head permeameter

TOPIC: 12 – SOIL COMPACTION:
12.01 Difference between compaction and consolidation
12.02 Factor affecting the soil compaction
12.03 Methods of soil compaction used in field by static and vibrating rollers

TOPIC: 13 – BEARING CAPACITY OF SOIL:
13.01 Factors affecting the bearing capacity of soil
13.02 Methods of determining bearing capacity of soil
13.03 Determination of bearing capacity by lead test

Books Recommended:
1 Soil Mechanics and Foundation - B.C.Punania
2 Soil Mechanics and Foundation Engineering - Bhagirath Lal Gupta
   Standard publishers Distributors, Delhi-6
3 Nature and Properties of Soil - N.C. Brady
   S. Chand & Company Ltd, New Delhi.
   Tata McGraw Hill publishing company Ltd.

SCHEME OF EXAMINATION FOR FINAL EXAMINATION
F.M. : 80
Rationale & Objective:
A Diploma holder technician in Agricultural Engineering must know the operations control, maintenance and repairing idea of different sources of power used in Agricultural sector. For proper utilization of agricultural machinery, processing equipments in agricultural FARM and FARM with safety for stationary & mobile engines, this course is designed with following contents:
- Idea of conventional animal, human, coal, fuel and non-conventional solar and wind power sources of energy used in agricultural sector
- Scope of mechanization, its availability and suitability in Indian condition. Principle of operation of different engines
- Different Engines system
- Different engine components, different control devices repair, maintenance & safety devices of engines
- Power estimation and power losses
- Introduction of mobile engines and tractors

S.No. | Topics | Periods
--- | --- | ---
01 | Introduction of Energy Sources | (03)
02 | Scope of Mechanisation in Indian Condition from suitability & availability point of view | (03)
03 | Principles and components of internal combustion engines | (04)
04 | Two and Four Stroke cycles engine | (04)
05 | Valve system and valve timing | (04)
06 | Fuel Supply System | (04)
07 | Fuel Injection System | (04)
08 | Lubricating System | (04)
09 | Cooling System | (04)
10 | Pre Air Cleaner & Air Cleaner | (04)
11 | Governing System | (04)
12 | Mobile Engine & Tractors | (04)
13 | Power Tiller and its components | (04)
TOPIC: 09 – COOLING SYSTEM: [04]
- Need of cooling
- Air cooling
- Water cooling
- Thermo siphon and forced circulation cooling system
- Thermo static valve and its working

TOPIC: 10 – PRE AIR CLEANER & AIR CLEANER: [04]
- Need of Pre Air Cleaner & Air Cleaner
- Types of Air Cleaners
- Their construction, working & maintenance

TOPIC: 11 – GOVERNING SYSTEM: [04]
- Governing Hit and Miss system, throttle system, centrifugal pneumatic governor.
- Governor hunting and governor regulation.

TOPIC: 12 – MOBILE ENGINE AND TRACTORS: [04]
- Need of mobile engines
- History of development of mobile engine & tractor

TOPIC: 13 – POWER TILLER AND ITS COMPONENTS: [04]
- Walking type farm operation through power tiller.
- Different system of power tiller and its controlling units.
- Its advantages & disadvantages and suitability.

Books Recommended:

1. Farm Gas Engines and Tractors - R. Jones Fred
   Tata McGraw Hill publishing company Ltd.
   Jain Brothers, New Delhi
3. Practical Agricultural Engineering Vol. - I & II - Ghosh and Swain
   Naya Prakash 206, Bidhar Sarani, Kolkata
4. Tractors and Their Power Units - E.L. Barger, J.B. Liljedahl, W.M. Carleton, E.G. Mokibben
   Wiley Eastern Private Ltd., New Delhi
5. Farm Tractors Repair & Maintenance - S.C. Jain & C.M. Rai
   Standard Publisher Distributors, New Delhi
6. Tractor and Automobile - V. Redichev
   MIR Publication
7. Basic Automobile Engineering - C.P. Nokra
   Dhanpat Rai Publishing Company, New Delhi
8. Elements of Agricultural Engineering, Vol. - I & II - Jagdishwar Sahay
   Agro Book Agency, New Area, Jakkanpur, Patna – 1

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
WORKSHOP TECHNOLOGY

Subject Code
01208

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Rationale:
Workshop technology deals with different processes by which component of a machine or equipments are made, objectives of Agricultural Engineering Diploma holders will have to deal with different types of machines and tractors, so they are supposed to know different processes in workshop. keeping this in view, this subject has been included in the curriculum.

S.No. Topics Periods
01 Engineering Material (10)
02 Heat Treatment of Steel (03)
03 General Processes (04)
04 Introduction (05)
05 Blacksmithy Shop (08)
06 Estimating & Costing (02)
07 Estimation of Machining Time in Machine Shop (05)
08 Estimation in Welding Shop (08)
09 Estimation of Sheet Metal Shop (05)

(50)

CONTENTS:

TOPIC: 01 – ENGINEERING MATERIAL:

01.01 Classification of materials
01.02 Properties of materials
01.03 Crystal structure, unit cell & space lattice, metallic, space lattice, effect of grain size on properties of metals cooling curves for metals and alloys.
01.04 Brief ideas about ferrous metals and alloys
01.05 Brief ideas about non-ferrous metals and their alloys
01.06 Miscellaneous materials e.g. plastic, glass, plywood, packing materials, abrasive materials, belt materials, lubricating materials, their properties and uses.

TOPIC: 02 – HEAT TREATMENT OF STEEL:

02.01 Definition, objectives, iron-carbon equilibrium diagram
02.02 Different Heat treatment processes
02.03 Defects due to heat treatment of steel

TOPIC: 03 – GENERAL PROCESSES:

03.01 Welding, definition, types of electrodes, fluxes welding defects, gas cutting
03.02 Soldering, Definition, types of solder, soldering iron
03.03 Brazing, definition, types of brazing, atals, fluxes

TOPIC: 04 – INTRODUCTION:

04.01 Introduction
04.02 Safety measures in workshop
04.03 Indian factory acts on safety
04.04 Different types of carpentry tools and processes
04.05 Brief ideas about Band saw etc, wooden lathe circular saw, wood planner etc

TOPIC: 05 – BLACKSMITHY SHOP:

05.01 Introduction
05.02 Different tools and their uses
05.03 Different forging operations
05.04 Defects of forging
05.05 Brief ideas about power hacksaw etc.

TOPIC: 06 – ESTIMATING & COSTING:

06.01 Introduction of Estimating & Costing
06.02 Elements & Cost

TOPIC: 07 – ESTIMATION OF MACHINING TIME IN MACHINE SHOP:

07.01 Introduction length of cut, feed, depth of cut, RPM, cutting speed, time, time allowances.
07.02 Estimation of machining time for different Lathe operations.
07.03 Estimation of machining time for shaping, slotting and planning operations.

TOPIC: 08 – ESTIMATION IN WELDING SHOP:

08.01 Introduction, types of welding, types of welding joints, edge preparation, welding techniques.
08.02 Gas welding and gas cutting, arc welding, estimation of welding cost.

TOPIC: 09 – ESTIMATION OF SHEET METAL SHOP:

09.01 Introduction, different operations, sheet metal joints.
09.02 Allowances for sheet metal, operations & joints, estimate of cost.
Books Recommended:

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Author(s)</th>
<th>Publisher</th>
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<tr>
<td>2</td>
<td>Introduction to Estimating &amp; Costing</td>
<td>GBS Narang and V. Kumar</td>
<td>Khanna publishers, Delhi - 6</td>
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<tr>
<td>4</td>
<td>Estimates &amp; Cost</td>
<td>C.K. Singh &amp; M.I. Khanna</td>
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SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
Rationale & Objective:
Keeping in view the recent developments in Science and present needs of Agriculture, the curriculum of Refrigeration & Air-Conditioning has been revised so that the Engineers or Technicians may have a better knowledge of Refrigeration & Air-Condition, especially regarding the application of the subject in various fields of Agriculture. An emphasis, in this direction, has been made in the curriculum.

The following topics are so chosen that through their contents the students become able to develop knowledge, skill and technical attitude. It will enable them to distinguish, differentiate, analyse and solve the refrigeration and air-conditioning problems.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
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<td>GROUP A (REFRIGERATION)</td>
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<tr>
<td>01</td>
<td>Principles of Thermodynamics</td>
<td>(02)</td>
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<tr>
<td>02</td>
<td>Method of Refrigeration</td>
<td>(03)</td>
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<tr>
<td>03</td>
<td>Air Refrigeration Systems</td>
<td>(05)</td>
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<tr>
<td>04</td>
<td>Simple Vapour Compression System</td>
<td>(05)</td>
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<tr>
<td>05</td>
<td>Simple Vapour Absorption and Electrolux Refrigeration System</td>
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<tr>
<td>06</td>
<td>Refrigerants</td>
<td>(03)</td>
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<td>07</td>
<td>Refrigeration Equipments</td>
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<tr>
<th>S.No.</th>
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<tr>
<td>GROUP B (AIR-CONDITIONING)</td>
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<tr>
<td>01</td>
<td>Introduction to Psychrometry</td>
<td>(04)</td>
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<tr>
<td>02</td>
<td>Different Psychrometric Processes</td>
<td>(05)</td>
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<tr>
<td>03</td>
<td>Requirements of Comfort Air-conditioning (only introduction)</td>
<td>(03)</td>
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<tr>
<td>04</td>
<td>Air-conditioning Systems (introduction only)</td>
<td>(03)</td>
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<tr>
<td>05</td>
<td>Air-conditioning Equipments</td>
<td>(05)</td>
</tr>
<tr>
<td>06</td>
<td>Household Refrigerators, Cold Storage, Air cooler and Window Air-conditioners</td>
<td>(05)</td>
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CONTENTS:

GROUP A (REFRIGERATION)

TOPIC: 01 – PRINCIPLE OF THERMODYNAMICS:
01.01 Pressure
01.02 Thermodynamic systems
01.03 Property, state, path and process
01.04 Internal energy, Flow energy and work
01.05 Specific heat, sensible heat and latent heat
01.06 Quality of vapours
01.07 Enthalpy and Entropy

TOPIC: 02 – METHOD OF REFRIGERATION:
02.01 Ice refrigeration
02.02 Evaporative refrigeration
02.03 Refrigeration by expansion of air
02.04 Steam jet refrigeration system
02.05 Dry ice refrigeration system
02.06 Unit of refrigeration

TOPIC: 03 – AIR REFRIGERATION SYSTEMS:
03.01 Reversed Carnot Cycle
03.02 Bell-Coleman refrigeration system (simple numericals)
03.03 Advantages and disadvantages of air refrigeration system

TOPIC: 04 – SIMPLE VAPOUR COMPRESSION SYSTEM:
04.01 Ideal Vapour compression
04.02 Vapour Compression System
04.03 Wet Compression
04.04 Dry Compression
04.05 Superheated compression (simple numerical only)

TOPIC: 05 – SIMPLE VAPOUR ABSORPTION AND ELECTROLUX REFRIGERATION SYSTEM:
05.01 Basic vapour absorption system
05.02 Ammonia absorption system, block diagram only, no numericals.
05.03 Electrolux refrigeration system, block diagram only.

TOPIC: 06 – REFRIGERANTS:
06.01 Classification of refrigerants.
06.02 Different properties of NH₃, CO₂, SO₂ refrigerants.
TOPIC: 07 – REFRIGERATION EQUIPMENTS (INTRODUCTION ONLY):
07.01 Compressors
07.02 Condensers and Cooling towers
07.03 Evaporators
07.04 Expansion devices

GROUP B (AIR-CONDITIONING)

TOPIC: 01 – PSYCHROMETRY:
01.01 Meaning of air-conditioning
01.02 Psychrometry and psychrometric properties
01.03 Psychrometric relations
01.04 Psychrometric chart

TOPIC: 02 – DIFFERENT PSYCHROMETRIC PROCESSES:
02.01 Sensible cooling and heating
02.02 Adiabatic humidification and dehumidification (simple numericals)
02.03 Summer air-conditioning, winter air-conditioning and year round conditioning

TOPIC: 03 – REQUIREMENTS OF COMFORT AIR-CONDITIONING (INTRODUCTION ONLY):
03.01 Elements of comfort air-conditioning
03.02 Thermodynamics human body
03.03 Ventilation and Ventilation standard

TOPIC: 04 – AIR-CONDITIONING SYSTEM (INTRODUCTION ONLY):
04.01 Central air-conditioning system
04.02 Unitary air-conditioning system
04.03 Problems in air-conditioning system

TOPIC: 05 – AIR-CONDITIONING EQUIPMENTS (INTRODUCTION ONLY):
05.01 Air cleaning and filters
05.02 Humidifiers and dehumidifiers
05.03 Fans and blowers
05.04 Grills and Registers

TOPIC: 06 – HOUSEHOLD REFRIGERATORS, COLD STORAGE, AIR COOLER AND WINDOWS AIR-CONDITIONERS:
06.01 Household Refrigerator
06.02 Cold Storage line diagram only
06.03 Air Cooler
06.04 Window Air-Conditioners

Books Recommended:
1. Refrigeration Air-Conditioning - S.C. Arora
   - S. Domkundwar

SCHEME OF EXAMINATION FOR FINAL EXAMINATION  F.M. : 80
Rationale:
From Mechanisation is the application of engineering and technology in agricultural operations to do a job in a better way to improve productivity. This includes development, application and management of all mechanical aids for field production, Water control, material holding, storing and processing. Before knowing these, diploma students are required to know about agricultural operations, procedures and practices.

Objective:
The course is designed with following objective:
- to develop knowledge about Agricultural Engineering and its relation to crop production
- to develop knowledge about soil
- to develop knowledge about crop rotation and system of cropping
- to know the techniques of raising field crops
- to know the techniques of raising horticultural crops
- to know about weeds and their control
- to know about irrigation methods
- to develop knowledge about crop identification

S.No.   Topics                      Periods
01     Introduction                (02)
02     Soil                        (04)
03     Crop rotation and system of cropping (05)
04     Techniques of raising field crops (18)
05     Techniques of raising horticultural crops (09)
06     Weeds and their control     (05)
07     Miscellaneous              (07)

CONTENTS:

TOPIC: 01 – INTRODUCTION:
01.01 Introductory idea about Agricultural Engineering and its relation to crop production
01.02 Basic information about Agricultural operations with Agricultural Implements and Machineries

TOPIC: 02 – SOIL:
02.01 Classification of soils
02.02 Soil formation
02.03 Composition of soil
02.04 Soil fertility and plant nutrients

TOPIC: 03 – CROP ROTATION AND SYSTEM OF CROPPING:
03.01 Crop rotation
03.01.01 Principles of crop rotation
03.01.02 Advantages of crop rotation
03.02 System of cropping
03.02.01 Mixed cropping
03.02.02 Multiple cropping
03.02.03 Inter cropping
03.02.04 Their principles and advantages

TOPIC: 04 – TECHNIQUES OF RAISING FIELD CROPS:
04.01 Cereals
04.01.01 Paddy
04.01.02 Wheat
04.01.03 Maize
04.02 Legumes
04.02.01 Soyabean
04.02.02 Moong
04.02.03 Arhar
04.02.04 Gram
04.02.05 Peas
04.03 Cash Crops
04.03.01 Sugar cane
04.03.02 Potato
04.04 Oil Seeds
04.04.01 Rape seed and Mustard
04.04.02 Sunflower
04.04.03 Groundnut
04.05 Forage Crops
04.05.01 Beesem
04.05.02 Lucerne
### TOPIC: 05 – TECHNIQUES OF RAISING HORTICULTURAL CROPS:

<table>
<thead>
<tr>
<th>05.01</th>
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<td>Mango</td>
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<td>Guava</td>
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<td>05.01.05</td>
<td>Litchi</td>
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<td>05.03</td>
<td>Flowering crops</td>
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<td>Rose</td>
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<td>05.03.02</td>
<td>Dhalia</td>
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<td>05.03.03</td>
<td>Chrysanthemum</td>
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<td>05.03.04</td>
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### TOPIC: 06 – WEEDS AND THEIR CONTROL:

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<th>06.01</th>
<th>Characteristics of weeds</th>
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<tr>
<td>06.02</td>
<td>Harmful effects of weeds</td>
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<td>06.03</td>
<td>Usefulness of weeds</td>
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<td>06.04</td>
<td>Classification of weeds</td>
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<td>06.05</td>
<td>Medium of weeds seed dispersal</td>
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<td>06.06</td>
<td>Method of weed control</td>
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### TOPIC: 07 – MISCELLANEOUS:

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<th>Methods of irrigation</th>
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<td>Methods of fertilizer application</td>
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<td>07.03</td>
<td>Dry farming</td>
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<td>07.04</td>
<td>Water management practices</td>
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<td>Soil management practices</td>
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<td>07.06</td>
<td>Seed</td>
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<td>07.06.01</td>
<td>Characteristics of good seed</td>
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<td>07.06.02</td>
<td>Types of seeds</td>
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<td>07.06.03</td>
<td>Seed treatment</td>
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<td>07.07</td>
<td>Crop identification</td>
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<td>07.07.01</td>
<td>Wheat, Barley, oat and wild oat</td>
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<td>07.07.02</td>
<td>Maize, Jowar and Bajara</td>
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<tr>
<td>07.07.03</td>
<td>Soyabean, Cowpea, Blackgram and Green gram</td>
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<td>07.07.04</td>
<td>Sarson, Rape, Rai and Taramira</td>
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### Books Recommended:


### SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
ENGINEERING MECHANICS Lab.

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Rationale & Objectives:
The Engineering Mechanics Laboratory is a subject which will help technician to understand the application of theory that he has studied in practice by performing experiments and verifying results. Besides the above the objective of the curriculum with effective skill will be developed in them to observe experimental data, and to analyses the results.

These topics of this curriculum will certainly build their confidence in performing the utilization of principle of mechanics in Civil Engineering works.

CONTENTS:
Eight experiments to be performed in the laboratory:

1. Determination of elongation of wire under external load.
2. Tensile Test on mild steel specimen.
3. Tensile Test on high tensile specimen.
4. Compression Test on metal.
5. Compression Test on bricks.
7. Determination of reaction at the support of beam.
8. Determination of bending moment of a simply supported beam.
9. Determination of reaction at the support of roof truss.
10. Determination of deflection of beams.
12. Determination of bending moment of a over hanging beam.
13. Verification of Polygon Law of forces.
14. Verification of Triangle Law of forces.
15. To find moment of inertia of fly wheel.
16. Compression Test on metal.
17. Tensile Test on M.S.specimen.
18. Determination of co-efficient of friction on inclined plane.

Books Recommended:

Text Books


SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 40
COMPUTER PROGRAMMING THROUGH ‘C’ Lab.

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<td>2.</td>
<td>Programming exercise on editing C program.</td>
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<tr>
<td>3.</td>
<td>Programming exercise on defining variables and assigning values to variable.</td>
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<td>4.</td>
<td>Programming exercise on arithmetic and relational operations.</td>
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<td>5.</td>
<td>Programming exercise on arithmetic expressions and their evaluation</td>
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<td>6.</td>
<td>Programming on infix, postfix, transformation using stack.</td>
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<td>7.</td>
<td>Programs on insertion, deletion on link list.</td>
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<td>12.</td>
<td>Programming in C</td>
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SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 40

20
FARM POWER AND TRACTOR

Subject Code
01213

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Rationale:
A Diploma holder in Agricultural Engineering student has to operate the different machinery with I.C. Engine power source for stationary & moving process.

Objective:
The present practical course is designed to familiarise the different components of the I.C. engine as well as to provide well practice over the different control units of the stationary and moving engine operation with safety.

At least Eight experiments to be done from the following list of experiments:

01 Familiarisation with different engine parts viz stationary, reciprocating and rotating.
02 Study of two stroke and four stroke cycle engine.
03 Study of valves and valves arrangement. Determination of valve timing and firing orders of multicylinder engine.
04 Familiarization with carburettors adjustment and air supply system.
05 Diesel fuel supply system, injector adjustments and air bleeding.
06 Study of cooling system in stationary engines and moving engines like tractor.
07 Study of lubricating system.
08 Study of operation of power tillers.
09 Familiarisation with different controls on the tractor and indicators with traffic signals.
10 Tractor driving practice in different gears without implements.
11 Tractor driving practice, certain limited area in specified by Instructor viz. L-shape, S-shape, Circle, 8-shape etc.
12 Study about periodic trouble shooting.

Books Recommended:

1 Farm Gas Engines and tractors - R. Jones Fred
   Tata McGraw Hill publishing company Ltd.
   Jain Brothers, New Delhi
3 Practical Agricultural Engineering Vol. - I & II - Ghosh and Swain
   Naya Prakash 206, Bidhan Sarani, Kolkata
4 Tractors and Their Power Units - E.L. Barger, J.B. Liljedahl, W.M. Carleton, E.G. Mokibben
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   Standard Publisher Distributors, New Delhi
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   MIR Publication
7 Basic Automobile Engineering - C.P. Nokra
   Dhanpat Rai Publishing Company, New Delhi
8 Elements of Agricultural Engineering, Vol. - I & II - Jagdiswar Sahay
   Agro Book Agency, New Area, Jakkanpur, Patna – 1

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 40
WORKSHOP TECHNOLOGY

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01 Turning, Knurling, Facing, Drilling, Threading, Tapping, Boring on a job on lathe m/c.
02 Step turning on lathe.
03 Working of different carpentry m/c’s e.g. band saw m/c, circular saw m/c, planner m/c and grinding, shaping m/c.
04 Electric welding and gas welding, different joints, grill gate, garden chair, joining of two parts.
05 Different operation in sheet metal shop, making of mug, furmel, bucket, milk container, tray.
06 Black Smithy shop – different operation, making of ring, khurpi, screwdriver.

Each student has to make two jobs on lathe, two jobs in Black Smithy shop, two jobs in welding shop, one job in sheet metal shop and one job in wooden lathe – total eight jobs.

07 Estimation of machining time in different lathe operation e.g. step turning, facing, chamfering, knurling, threading.

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 40
**Rationale:**
Drawing is the language of engineers. Without the knowledge and skill of drawing an Agricultural Engineering Diploma Holder becomes handicapped in understanding the problems right from design state of machine components to the production. This subject will help a technician in understanding the functioning of different machine parts which will help in maintenance, dismantling and assembly of machines parts from machinery & food process machines parts during its production process too. This subject will develop confidence and will improve the ability of concept.

**Objective:**
The students will be able to:
- Understand screw threads and its characteristics representation
- Understand the fastening types and its representation
- Understand the different types of joints used and its representation
- Can get the ability to understand the different types of power coupling used in farm machinery and its representation
- Can develop the ability to represent the agricultural machinery components by free hand sketch
- Develop drafting skill and be able to apply the knowledge & skill of drawing in practical field.

**CONTENTS:**

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<td>Orthographic Drawing, 1st angle projection</td>
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<td>Isometric and oblique drawing of related agriculture implement</td>
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<td>Line and Block diagram of:</td>
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<td>(a) Transmission system of a four wheel tractor.</td>
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<td>Free hand sketching of:</td>
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<td>(a) Universal and muff coupling</td>
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<td>(c) Plummer block</td>
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<td>(d) Stuffing box</td>
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<td>(e) Crank shaft</td>
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<td>(g) Screw jack</td>
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<td>(h) Cultivator</td>
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<td>(i) Cage wheel</td>
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<tr>
<td>(m) Disc Harrow</td>
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<td>(n) M.B. plough</td>
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**Books Recommended:**

Subject Code
01216

Sessional

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<th>No. of Periods Per Week</th>
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<th>No of Period in one session : 50</th>
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Rationale:
Diploma Holder in Agricultural Engineering Diploma Student has to work related to Irrigation & Drainage Engineering where use of different aspects of instrument is must. In view of the following objective this sessional course has been designed.

Objective:
To familiarize and know the use of the instruments related to Hydraulics & Fluid Mechanics.

Students have to get the study of FIVE of the following assignments for practical concept.

CONTENTS:

01 Study of piezometer and pressure gauges used in hydraulics.
02 Study of Bernauli’s experiment.
03 Study of Venturimeter and its uses.
04 Study of notches & mouth pieces.
05 Study of pilot tube
06 Study of manometer
07 Study of Centrifugal pump & its characteristics
08 Study of Reciprocating pump
09 Study of head losses in pipes due to bends, sudden contraction
10 Study of measurement of hydraulic flow and discharge

Books Recommended:

1 Fluid Mechanics & Hydraulics - Dr. Jagdish Lal
   Metropolitan Book Co. Pvt. Ltd., New Delhi
2 Hydraulics Fluid Mechanics & Fluid Machines - S. Ramanrutham
   S. Chand & Co., Ram Nagar, New Delhi
4 A Text Book of Fluid Mechanics & Hydraulics - R.K. Bansal
   Laxmi Publication, New Delhi
5 Tube Well & Pumps - Dr. A.M. Michel
   Water Technology Centre, ICAR, New Delhi
6 Open Channel Flow - V.T. Chaw
   Mc Graw Hill Co.
Rationale:
An Agricultural Engineering Diploma student is required to know about soil structure and texture. He has to apply engineering and technology in agricultural operation in a better way to improve productivity.

Objective:
The course is designed with following objectives:
- to understand about soil science and soil mechanics and its relation with crop production
- to know about soil pH, soil classification, method of sample taking etc.
- to develop skill about engineering properties of soil.

At least Eight sessional topics must be carried out by the students.

1. Study about soil classification.
2. Study about texture and structure of soil.
3. Study about essential plant nutrients.
4. Study about acid and alkali soils and principles of their management.
5. Study about soil compaction.
6. Study about soil sample taking methods from the field.
7. Study about soil pH and its determination by pH meter.
8. Study about determination of N:P:K of given soil sample.
9. Study about determination of moisture content of given soil sample.
10. Study about determination of grain size distribution of given soil sample by Sieve Analysis.
11. Study about determination of liquid limit of given soil sample.
12. Study about determination of field density and void ratio of soil by the help of core cutter.

Books Recommended:
1. Soil Mechanics and Foundation - B.C. Punania
2. Soil Mechanics and Foundation Engineering - Bhagirath Lal Gupta
   Standard publishers Distributors, Delhi
   S. Chand & Company Ltd, New Delhi.
   Tata McGraw Hill publishing company Ltd.
Rationale:
A diploma student of Agricultural Engineering has to install and maintain agricultural and irrigational equipments. He is required to know about cropping patterns, prevailing in the state and country. He is also required to assess the water and fertilizer requirements, about different crop diseases, insects and pests, methods of seedbed preparation and sowing etc.

Objective:
The sessional subject has been designed to develop the skill in an Agricultural Engineering student, so that he is able to:
- identify weeds
- protect plants from insects, pests and diseases
- know about the package practices for crop plants.

At least eight sessional topics must be carried out by the students.

01 Study about scientific names of major crops of cereals, pulses, oil seeds, fibre crops, sugar cane, tuber and root crops, spices and condiments, forage grasses, forage legumes and plantation crops.
02 Study about characteristics and suitability of various fertilizer for various crops.
03 Study about methods of fertilizer application.
04 Study about plant deficiencies symptoms.
05 Study about schedule for seed treatment of major crops.
06 Study about main diseases, its symptoms and control measures for major crops.
07 Study about major pests of stored products.
08 Study about main insects and its control measures for major crops.
09 Study about weed control practices for important crops.
10 Study about the schedule of important agro-techniques for major crops.
11 Study about most prominent varieties for major crops.
12 Study about crop rotation for major crops.

Books Recommended:
1 Handbook of Agricultural Science - S.S. Singh
   Kalyani Publishers, New Delhi
3 Principles and practices of Agronomy - S.S. Singh
   Kalyani Publishers, New Delhi
4 Modern Techniques of Raising Field Crops - Chhida Singh