

**Scheme of Teaching and Examination for  
III Semester DIPLOMA in AGRICULTURAL ENGINEERING BRANCH**

**THEORY**

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION SCHEME					
			Periods per Week	Periods in one Session	Hours of Exam.	Terminal Exam. (A) Marks	Final Exam. (B) Marks	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
1	Professional Mathematics	00301	6	60	3	20	80	100	26	36
2	Engineering Mechanics	00302	4	50	3	20	80	100	26	36
3	Computer Programming Through 'C'	00303	4	50	3	20	80	100	26	36
4	Refrigeration & Air-Conditioning	11304	4	50	3	20	80	100	26	36
5	Principles of Agricultural Production	11305	4	50	3	20	80	100	26	36
<b>Total :-</b>			<b>22</b>					<b>500</b>		

**PRACTICAL**

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION SCHEME					
			Periods per Week	Periods in one Session	Hours of Exam.	Marks Internal Exam. (A)	Marks External Exam. (B)	Total Marks (A+B)	Pass Marks Final Exam.	Pass Marks in the Subject
6	Engineering Mechanics Lab.	00306	4	50	3	10	40	50	16	21
7	Computer Programming Through 'C'	00307	6	60	3	10	40	50	16	21
<b>Total :-</b>			<b>10</b>					<b>100</b>		

**SESSIONAL**

Sl. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME		EXAMINATION SCHEME			
			Periods per Week	Periods in One Session	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject
8	Refrigeration & Air-Conditioning	11308	4	50	20	30	50	25
9	Principles of Agricultural Production	11309	6	60	40	60	100	50
<b>Total :-</b>			<b>10</b>				<b>150</b>	

<b>Total Periods per Week</b>	<b>42</b>	<b>Total Marks</b>	<b>750</b>
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# PROFESSIONAL MATHEMATICS

<b>Subject Code</b> <b>00301</b>	<b>Theory</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>06</b>	<b>00</b>	<b>00</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

**Rationale:**

A technical diploma holder is engaged generally as first line supervisor. He forms a bridge between workers and management. He has to understand the language of the modern management and communicate with the workers in their language. This subject will help accomplishment of the task in stipulated time, develop attitude towards cost effectiveness, selection of most effective alternative methods. This course will also help the student to tackle different numerical methods and computational techniques for problem solving in research organization as a programmer.

**Objective:**

The course enables students to.

- Managerial skill based on mathematical footing
- The ability to find approximate solutions and/or answers to the problems where analytical methods become more complex.
- To choose correct numerical techniques for a given problem.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	GROUP –A (Numerical Methods)	(20)
02	GROUP-B (Statistical Techniques)	(20)
03	GROUP-C (Management Techniques)	(20)
<b>Total:</b>		<b>(60)</b>

**CONTENTS:**

**GROUP-A (NUMERICAL METHODS) (20)**

- 01.01 Introduction to Numerical methods: Approximation and errors (Truncation & Round off).
- 01.02 Numerical solutions of non-linear and Transcendental equations: Iterative methods. Newton-Raphson’s method. Bisection method and Regula-Falsi method.
- 01.03 Solution of Linear Simultaneous Equations: Gaussian Elimination method and Gauss-Jordan method.
- 01.04 Finite Difference: Backward and forward Differences. Finite Difference Interpolation Formula. Newton’s Forward Difference formula and Newton’s Backward Difference formula.
- 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 Difference equations. simple problem Only

**GROUP-B (STATISTICAL TECHNIQUES) [20]**

- 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.
- 02.02 Theory of Probability: Random events and their types. Probability of Events. Definitions. Laws of Probability (Addition and Multiplication Laws)
- 02.03 Probability Distribution: Introduction to Arithmetic Mean and Standard Deviation of a probability distribution. Important probability distribution – Binomial distribution. Poisson’s distribution & Their means and variance.

**GROUP-C (MANAGEMENT TECHNIQUES) [20]**

- 03.01 Linear Models
- 03.01.01 Introduction to Operations Research (O.R) Steps of O.R.
- 03.01.02 Linear Programming Problems: Formulation of a LPP. Mathematical Modelling and Solution by graphical method.
- 03.01.03 Solution by Simplex Method: Basic Feasible Solution (Degenerator and Non-degenerator)
- 03.01.04 Transportation problem: Introduction and Solution Procedure-
  - (i) Finding the initial basic feasible solution by N-W Corner Rule, Least cost method and Vogel’s Approximation Method.
  - (ii) Test of optimality by **u-v** method only.
- 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.

**Books Recommended: Text Books**

- |    |   |   |  |
|----|---|---|--|
| 1. | Operations Research. Sultan Chand & Sons, New Delhi, 1990     | - | Kanti Swaroop. P.K Gupta and Man Mohan |
| 2. | Operations Research. Sultan Chand & Sons, New Delhi, 1990     | - | Heera & Gupta                          |
| 3. | Operations Research. Macmillan Publishing Co. New York, 1982  | - | H.A.Taha                               |
| 4. | Computer based numerical algorithm, East West Press, 1975     | - | E.V Krishna Murthy & S.V. Sen          |
| 5. | Computer oriented numerical method, Prentice Hall India, 1980 | - | V. Rajaraman                           |

## ENGINEERING MECHANICS

<b>Subject Code</b> <b>00302</b>	<b>Theory</b>			<b>No of Period in one session : 50</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>04</b>	<b>00</b>	<b>00</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

**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.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
<b><u>PART-A</u></b>		
01	Introduction	(02)
02	Vector Methods	(02)
03	Introduction to system of forces and equilibrium	(06)
04	Friction	(04)
05	Kinematics and kinetics of a particle	(03)
06	Kinematics and kinetics of rigid body	(02)
07	Impulse and Momentum	(02)
08	Work, Energy and Power	(04)
<b>Total :</b>		<b>(25)</b>
<b><u>PART-B</u></b>		
01	Simple stress and strains	(07)
02	Elastic constants	(03)
03	Center of Gravity (Centroid)	(02)
04	Moment of Inertia	(05)
05	Shearing force and bending moments	(08)
<b>Total :</b>		<b>(50)</b>

**CONTENTS:**

**PART-A**

**TOPIC: 01 – INTRODUCTION:**

Idealisation of mechanics; Concept of rigid body; External forces (Body forces & surface forces) Law of Mechanics. [02]

**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. [02]

**TOPIC: 03 – INTRODUCTION TO SYSTEM OF FORCES AND EQUILIBRIUM:**

[06]

Statically equivalent force system; simplest equivalent of a system of forces; force analysis, free body diagram, equation of equilibrium.

<b>TOPIC: 04 – FRICTION:</b>	[04]
Basic Concept of different Friction (Static, Dynamic, Sliding, Rolling, Fluid).	
<b>TOPIC: 05 – KINEMATICS AND KINETICS OF A PARTICLE:</b>	[03]
Rectilinear and curvilinear translations; normal and tangential component of acceleration.	
<b>TOPIC:06 – KINEMATICS AND KINETICS OF RIGID BODY:</b>	[02]
Simple concept of Angular Velocity and angular acceleration. Effective forces on a rigid body. D’ Alembert’s principle.	
<b>TOPIC:07 – IMPULSE AND MOMENTUM:</b>	[02]
Concept of Linear impulse and linear momentum, angular impulse and angular momentum, definitions only;	
<b>TOPIC: 08 – WORK, ENERGY AND POWER:</b>	[04]
Work done by forces and couples, potential and kinetic energy, work-energy; conservation of energy; concept of power and efficiency.	

**PART-B**

<b>TOPIC: 01 – SIMPLE STRESSES &amp; STRAIN:</b>	[07]
01.01 Definition of various terms and their units (S.I. Units)	
01.02 Stress and strain due to axial load and transverse load relation between stress and strain. Hook’s law. Studies of stress strain curve. Factor of safety & working stress. Concepts of isotropic materials.	
01.03 Stress & strain in simple section & composite bar. Stress & strain due to temperature variation.	
01.04 Shrinking on hoop’s stresses.	
<b>TOPIC: 02 – ELASTIC STRESS &amp; STRAIN:</b>	[03]
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 Simple shear. Complementary shear stress.	
02.05 Various Relations among modulus of elasticity, modulus of rigidity & bulk modulus.	
<b>TOPIC: 03 – CENTER OF GRAVITY (CENTROID):</b>	[02]
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.	
<b>TOPIC: 04 – MOMENT OF INERTIA:</b>	[05]
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.	
<b>TOPIC: 05 – SHEARING FORCE &amp; BENDING MOMENT:</b>	[08]
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**

1. Strength of Materials	- R.S. Khurmi
2. Mechanics of Structure	- S.B. Junarkar
3. Strength of Materials	- Ramamrutham
4. Theory of Structure	- Vazirini & Ratwani
5. Strength of Materials & Mechanics of Structure.	- Punamia
6. Teaching plans of Strength of Material	- T.T.T.I. Madras
7. द्रव्य सामर्थ्य	- गुरुचरण सिंह
8. Engineering Mechanics	- I.H. Shames
9. Engineering Mechanics	- Beer & Johnson
10. Strength of material	- S.K. Singh

# COMPUTER PROGRAMMING THROUGH C

<b>Subject Code</b> <b>00303</b>	<b>Theory</b>			<b>No of Period in one session : 50</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>04</b>	<b>00</b>	<b>00</b>	<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

**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”.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Introduction to Programming	(03)
02	Algorithm for Problem Solving	(08)
03	Introduction to ‘C’ Language	(08)
04	Condition and Loops	(07)
05	Arrays	(07)
06	Functions	(07)
07	Structures and Unions	(04)
08	Pointers	(06)
<b>Total :</b>		<b>(50)</b>

**CONTENTS:**

**TOPIC: 01 – INTRODUCTION TO PROGRAMMING:** **[03]**

The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation. Programming Style-Names, Documentation & Format, Refinement & Modularity.

**TOPIC: 02 – ALGORITHM FOR PROBLEM SOLVING:** **[08]**

Exchanging values of two variables, summation of a set of numbers. 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. Compute sine Series. Check whether a given number is Palindrome or not. Find Square root of a quadratic equation. multiplication of two matrices,

**TOPIC: 03 – INTRODUCTION TO ‘C’ LANGUAGE:** **[08]**

- 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 of the given algorithms

**TOPIC: 04 – CONDITIONAL STATEMENTS AND LOOPS:** **[07]**

- 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

**TOPIC: 05 – ARRAYS:** **[07]**

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.

**TOPIC: 06 – FUNCTIONS:****[07]**

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, Passing arguments to a Function: call by reference; call by value.

**TOPIC: 07 – STRUCTURES AND UNIONS:****[04]**

Basic of Structures, Structures variables, initialization, structure assignment, Structures and arrays: arrays of structures,

**TOPIC: 08 – POINTERS:****[06]**

Concept of Pointers, Address operators, pointer type declaration, pointer assignment, pointer initialization pointer arithmetic.

**Book Recommended:**

1. Programming with C. Second Edition. Tata McGraw-Hill, 2000 - Byron Gottfried
2. How to solve by Computer, Seventh Edition, 2001, Prentice hall of India. - R.G. Dromey
3. Programming with ANSI-C, First Edition, 1996, Tata McGraw hill. - E. Balaguruswami
4. Programming with ANSI & Turbo C. First Edition, Pearson Education. - A. Kamthane
5. Programming with C. First Edition, 1997, Tara McGraw hill. - Venugopla and Prasad
6. The C Programming Language, Second Edition, 2001, Prentice Hall of India. - B. W. Kernighan & D.M. Ritchie
7. Programming in C, Vikash Publishing House Pvt. Ltd., Jungpura, New Delhi. - R. Subburaj
8. Programming with C Language, Tara McGraw Hill, New Delhi. - C. Balaguruswami
9. Elements of C, Khanna Publishers, Delhi. - M. H. Lewin
10. Programming in C. - Stephen G. Kochan
11. Programming in C, khanna Publishers, Delhi. - B. P. Mahapatra
12. Let us C, BPB Publication, New Delhi. - Yashwant kanetkar
13. Programming in C, Galgotia Publications Pvt. Ltd. Dariyaganj, New Delhi. - Kris A. Jamsa
14. The Art of C Programming, Narosa Publishing House, New Delhi. - Jones, Robin & Stewart
15. Problem Solving and Programming. Prentice Hall International. - A.C. Kenneth
16. C made easy, McGraw Hill Book Company, 1987. - H. Schildt
17. Software Engineering, McGraw Hill, 1992. - R.S. Pressman
18. Pointers in C, BPB publication, New Delhi. - Yashwant Kanetkar

## REFRIGERATION AND AIR-CONDITIONING

<b>Subject Code 11304</b>	<b>Theory</b>			<b>No of Period in one session : 50</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>04</b>			<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

### **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.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
<b>GROUP A (REFRIGERATION)</b>		
01	Principles of Thermodynamics	(03)
02	Method of Refrigeration	(04)
03	Air Refrigeration Systems	(07)
04	Simple Vapour Compression System	(07)
05	Refrigerants	(04)
		<b>(25)</b>

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
<b>GROUP B (AIR-CONDITIONING)</b>		
01	Introduction to Psychrometry	(05)
02	Different Psychrometric Processes	(06)
03	Requirements of Comfort Air-conditioning (only introduction)	(04)
04	Air-conditioning Systems (introduction only)	(04)
05	Household Refrigerators, Cold Storage, Air cooler and Window Air-conditioners	(06)
		<b>(25)</b>

### **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

**[03]**



**TOPIC: 02 – METHOD OF REFRIGERATION:** [04]

- 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:** [07]

- 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:** [07]

- 04.01 Ideal Vapour compression
- 04.02 Vapour Compression System
- 04.03 Wet Compression }  
04.04 Dry Compression }                      single stage only
- 04.05 Superheated compression  
(simple numerical only)

**TOPIC: 05 – REFRIGERANTS:** [04]

- 06.01 Classification of refrigerants.
- 06.02 Different properties of NH<sub>3</sub>, CO<sub>2</sub>, SO<sub>2</sub> refrigerants.

**GROUP B (AIR-CONDITIONING)**

**TOPIC: 01 – PSYCHROMETRY:** [05]

- 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:** [06]

- 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):** [04]

- 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]

- 04.01 Central air-conditioning system
- 04.02 Unitary air-conditioning system
- 04.03 Problems in air-conditioning system

**TOPIC: 05 – HOUSEHOLD REFRIGERATORS, COLD STORAGE, AIR COOLER AND WINDOWS AIR-CONDITIONERS:** **[06]**

- 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<br>S. Domkundwar |
| 2 | Refrigeration Air-Conditioning | - | R.S. Khurmi                 |
| 3 | Refrigeration Air-Conditioning | - | P.L. Ballaney               |

## PRINCIPAL OF AGRICULTURAL PRODUCTION

<b>Subject Code 11305</b>	<b>Theory</b>			<b>No of Period in one session : 50</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>80</b>
	<b>04</b>			<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

### 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)
			<b>(50)</b>

### CONTENTS:

#### TOPIC: 01 – INTRODUCTION:

- |       |  |      |
|-------|--|------|
|       |  | [02] |
| 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:

- |       |                                    |      |
|-------|------------------------------------|------|
|       |                                    | [04] |
| 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:

- |          |                                 |      |
|----------|---------------------------------|------|
|          |                                 | [05] |
| 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:**

[18]

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

04.03 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

**TOPIC: 05 – TECHNIQUES OF RAISING HORTICULTURAL CROPS:**

[09]

05.01 Fruit crops

05.01.01 Mango

05.01.02 Papaya

05.01.03 Guava

05.01.04 Banana

05.01.05 Litchi

05.02 Vegetable crops

05.02.01 Cole crops

05.02.02 Root-crops

05.02.03 Lady's finger

05.02.04 Tomato

05.02.05 Brinjal

05.03 Flowering crops

05.03.01 Rose

05.03.02 Dahlia

05.03.03 Chrysanthemum

**TOPIC: 06 – WEEDS AND THEIR CONTROL:**

[05]

06.01 Characteristics of weeds

06.02 Harmful effects of weeds

06.03 Usefulness of weeds

06.04 Classification of weeds

06.05 Medium of weeds seed dispersal

06.06 Method of weed control

**TOPIC: 07 – MISCELLANEOUS:**

[07]

07.01 Methods of irrigation

07.02 Water management practices

07.03 Soil management practices

07.04 Seed

07.04.01 Characteristics of good seed

07.04.02 Types of seeds

07.04.03 Seed treatment

07.05 Methods of fertilizer application

07.06 Dry farming

Books Recommended:

- |    |  |                                |
|----|--|--------------------------------|
| 1  | Modern Techniques of Raising Field Crops | - Chidda Singh.                |
| 2  | Principles and practices of Agronomy     | - S.S.Singh.                   |
| 3  | Handbook of Agricultural Science         | - S.S.Singh                    |
| 4  | Weed and Weedicide                       | - Dr. Rao                      |
| 5  | Principles and practices of Horticulture | - Pujari Lal                   |
| 6  | Principles of Agricultural Engineering   | - Dr. J. Sahay                 |
| 7  | Principles of Agricultural Engineering   | - Irshad Ali                   |
| 8  | A text book of soil science              | - T.D.Biswas and .K. Mukherjee |
| 9  | Nature and properties of soil            | - N.C.Brady                    |
| 10 | Hand Book of Agriculture                 | - I.C.A.R. Publication.        |

## ENGINEERING MECHANICS Lab.

<b>Subject Code</b> <b>00306</b>	<b>Practical</b>			<b>No of Period in one session 50</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>40</b>
	<b>04</b>			<b>Internal Exam.</b>	<b>:</b>	<b>10</b>

### 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.
6. Determination of Young's Modulus of Elasticity of wire.
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.
11. Determination of moment of inertia of fly wheel.
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

- |  |                   |
|--|-------------------|
| 1. अभियांत्रिक यांत्रिकी                           | . जे०के० कपूर     |
| 2. Strength of Materials                           | - Bininder Singh  |
| 3. Mechanics of Structure, Vol. 1                  | - S.B. Junarkar   |
| 4. Strength of Materials                           | - R.S. Khurmi     |
| 5. Engineering Mechanics and Strength of Materials | - I.B. Prasad     |
| 6. Teaching plans of Strength of Material          | - T.T.T.I. Madras |

## COMPUTER PROGRAMMING THROUGH 'C'

<b>Subject Code</b> <b>00307</b>	<b>Practical</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>40</b>
	<b>06</b>	<b>00</b>	<b>03</b>	<b>Internal Exam.</b>	<b>:</b>	<b>10</b>

### CONTENTS:

#### List of Practicals:

1. Programming exercise on executing a C program.
2. Programming exercise on editing C program.
3. Programming exercise on defining variables and assigning values to variable.
4. Programming exercise on arithmetic and relational operations.
5. Programming exercise on arithmetic expressions and their evaluation
6. Programming on infix, postfix, transformation using stack.
7. Programs on array implementation.

#### Books Recommended:

1. How to solve it by Computer, Prentice Hall of India, 1992. - R.G. Dromey.
2. The C Programming Language, Prentice Hall of India, 1989. - B.W. Kernighan & D.M. Ritchie.
3. The Spirit of C Programming, Jaico Publishing House, New Delhi, 1987. - Cooper, Mullish
4. Application Programming in C. Macmillain International editions, 1990. - Richa'd Johnson-  
Baugh & Martin Kalin
5. The Art of C Programming, Narosa Publishing House, New Delhi. - Jones, Robin & Stewart
6. Problem Solving and Programming. Prentice Hall International. - A.C. Kenneth.
7. C made easy, McGraw Hill Book Company, 1987. - H. Schildt
8. Software Engineering, McGraw Hill, 1992. - R.S. Pressman
9. Programming in C, Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi - R. Subburaj
10. Programming with C language, Tata McGraw Hill, New Delhi. - C. Balaguruswami
11. Elements of C, Khanna Publishers. Delhi - M. H. Lewin
12. Programming in C - Stephan G. Kochan.
13. Programming in C, Khanna Publishers. New Delhi - B.P. Mahapatra
14. Let us C, BPB Publication. New Delhi - Yashwant Kanetkar
15. Programming in C, Galgotia Publications Pvt. Ltd. Dariyaganj, New Delhi. - Kris A. Jamsa

## REFRIGERATION AND AIR-CONDITIONING

<b>Subject Code 11308</b>	<b>Sessional</b>			<b>No of Period in one session : 50</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>50</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>30</b>
	<b>04</b>			<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

### **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.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
<b>GROUP A (REFRIGERATION)</b>		
01	Principles of Thermodynamics	(03)
02	Method of Refrigeration	(04)
03	Air Refrigeration Systems	(07)
04	Simple Vapour Compression System	(07)
05	Refrigerants	(04)
		<b>(25)</b>

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
<b>GROUP B (AIR-CONDITIONING)</b>		
01	Introduction to Psychrometry	(05)
02	Different Psychrometric Processes	(06)
03	Requirements of Comfort Air-conditioning (only introduction)	(04)
04	Air-conditioning Systems (introduction only)	(04)
05	Household Refrigerators, Cold Storage, Air cooler and Window Air-conditioners	(06)
		<b>(25)</b>

### **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

**[03]**



<b>TOPIC: 02 – METHOD OF REFRIGERATION:</b>	<b>[04]</b>
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	

<b>TOPIC: 03 – AIR REFRIGERATION SYSTEMS:</b>	<b>[07]</b>
03.01 Reversed Carnot Cycle	
03.02 Bell-Coleman refrigeration system (simple numericals)	
03.03 Advantages and disadvantages of air refrigeration system	

<b>TOPIC: 04 – SIMPLE VAPOUR COMPRESSION SYSTEM:</b>	<b>[07]</b>
04.01 Ideal Vapour compression	
04.02 Vapour Compression System	
04.03 Wet Compression } 04.04 Dry Compression }                      single stage only	
04.05 Superheated compression (simple numerical only)	

<b>TOPIC: 05 – REFRIGERANTS:</b>	<b>[04]</b>
06.01 Classification of refrigerants.	
06.02 Different properties of NH <sub>3</sub> , CO <sub>2</sub> , SO <sub>2</sub> refrigerants.	

**GROUP B (AIR-CONDITIONING)**

<b>TOPIC: 01 – PSYCHROMETRY:</b>	<b>[05]+1</b>
01.01 Meaning of air-conditioning	
01.02 Psychrometry and psychrometric properties	
01.03 Psychrometric relations	
01.04 Psychrometric chart	

<b>TOPIC: 02 – DIFFERENT PSYCHROMETRIC PROCESSES:</b>	<b>[06]</b>
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	

<b>TOPIC: 03 – REQUIREMENTS OF COMFORT AIR-CONDITIONING (INTRODUCTION ONLY):</b>	<b>[04]</b>
03.01 Elements of comfort air-conditioning	
03.02 Thermodynamics human body	
03.03 Ventilation and Ventilation standard	

<b>TOPIC: 04 – AIR-CONDITIONING SYSTEM (INTRODUCTION ONLY):</b>	<b>[04]</b>
04.01 Central air-conditioning system	
04.02 Unitary air-conditioning system	
04.03 Problems in air-conditioning system	

**TOPIC: 05 – HOUSEHOLD REFRIGERATORS, COLD STORAGE, AIR COOLER AND WINDOWS AIR-CONDITIONERS: [06]**

- 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   |
| 2 | Refrigeration Air-Conditioning | - R.S. Khurmi   |
| 3 | Refrigeration Air-Conditioning | - P.L. Ballaney |

## PRINCIPLES OF AGRICULTURAL PRODUCTION

<b>Subject Code</b> <b>11309</b>	<b>Sessional</b>			<b>No of Period in one session : 60</b>		
	<b>No. of Periods Per Week</b>			<b>Full Marks</b>	<b>:</b>	<b>100</b>
	<b>L</b>	<b>T</b>	<b>P/S</b>	<b>Annual Exam.</b>	<b>:</b>	<b>60</b>
	<b>06</b>			<b>Internal Exam.</b>	<b>:</b>	<b>40</b>

### 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 **Six** 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<br>Kalyani Publishers, New Delhi                          |
| 2 Hand Book of Agriculture                 | - I.C.A.R. Publication.   |
| 3 Principles and practices of Agronomy     | - S.S.Singh<br>Kalyani Publishers, New Delhi                          |
| 4 Modern Techniques of Raising Field Crops | - Chhida Singh<br>Oxford & IBH Publishing Co.<br>Pvt. Ltd., New Delhi |