

**Scheme of Teaching and Examination for  
III Semester DIPLOMA in CIVIL (RURAL) 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	Non-conventional Energy	16304	4	50	3	20	80	100	26	36
5	Soil Mechanics	15305	4	60	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	Demonstration of Non-Conventional Energy Device	16308	6	50	40	60	100	50
9	Soil Mechanics	15309	4	50	20	30	50	25
<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
  2. Operations Research. Sultan Chand & Sons, New Delhi, 1990
  3. Operations Research. Macmillan Publishing Co. New York, 1982
  4. Computer based numerical algorithm, East West Press, 1975
  5. Computer oriented numerical method, Prentice Hall India, 1980
- Kanti Swaroop. P.K Gupta and Man Mohan
  - Heera & Gupta
  - H.A.Taha
  - E.V Krishna Murthy & S.V. Sen
  - 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:** [02]

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

**TOPIC: 02 VECTOR METHODS:** [02]

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.

**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><u>TOPIC: 04 – FRICTION:</u></b>	[04]
Basic Concept of different Friction (Static, Dynamic, Sliding, Rolling, Fluid).	
<b><u>TOPIC: 05 – KINEMATICS AND KINETICS OF A PARTICLE:</u></b>	[03]
Rectilinear and curvilinear translations; normal and tangential component of acceleration.	
<b><u>TOPIC:06 – KINEMATICS AND KINETICS OF RIGID BODY:</u></b>	[02]
Simple concept of Angular Velocity and angular acceleration. Effective forces on a rigid body. D’ Alembert’s principle.	
<b><u>TOPIC:07 – IMPULSE AND MOMENTUM:</u></b>	[02]
Linear impulse and linear momentum, angular impulse and angular momentum, definitions only;	
<b><u>TOPIC: 08 – WORK, ENERGY AND POWER:</u></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><u>TOPIC: 01 – SIMPLE STRESSES &amp; STRAIN:</u></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><u>TOPIC: 02 – ELASTIC STRESS &amp; STRAIN:</u></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><u>TOPIC: 03 – CENTER OF GRAVITY (CENTROID):</u></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><u>TOPIC: 04 – MOMENT OF INERTIA:</u></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><u>TOPIC: 05 – SHEARING FORCE &amp; BENDING MOMENT:</u></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. Balagurswami
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

# NON CONVENTIONAL ENERGY

<b>Subject Code 16304</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 conventional sources of energy are depleting day by day and will not be sufficient to meet the future demand of energy. Therefore, there is a need for the generation of energy by using non-conventional sources. With this in view the future diploma holders should be conversant with basic knowledge and practical application of non-conventional sources of energy in rural, cottage and small scale sectors. For rural development it is desirable to ensure the better living conditions of the people in the village. For this purpose technology transfer to meet the rural needs with this in view a separate branch called appropriate technology is being developed. Therefore, diploma holders should be aware of basic knowledge and application of the appropriate technology including bio gas technology etc. With this in view the subject has been introduced.

## **CURRICULUM**

<b>SL</b>	<b>Topics</b>	<b>Periods</b>
1.	Sources of Energy.	..
2.	Solar Energy	..
3.	Wind Energy	..
4.	Bio-Gas Energy	..
5.	Bio-Gas Technology	..
<b>Total</b>		<b>60</b>

## **CONTENTS**

<b>Topics</b>	<b>Content</b>	<b>Periods</b>
01	Sources of Energy	..
01.01	Solar, wind, hydro, fossil, fuel, tidal, geothermal, biogas, conventional and non-conventional, renewable and non-renewable types of energy system, application of above sources with reference to the state.	10
02	<b><u>Solar Energy</u></b>	12
02.01	Basic solar and thermal technology, principle of solar energy utilization.	..
02.02	Transparent materials, insulating materials and absorbing materials.	
02.03	Solar power generation (tower concept).	
02.04	Photo-voltaic converters, basic principle and their behavior and limitations. Storage of solar energy, capacities and cost.	
03	<b><u>Wind Energy</u></b>	12
03.01	Wind Map of India, Intensity of wind and wind energy utilization methods.	
03.02	Technical details of important components of a wind mill and their working. Types of wind mills and their efficiency.	
03.03	Selection of site, data to be collected during site-selection, installation of wind mill including site preparation and type of installation, points to be checked during and after installation.	
03.04	Application of wind mill for water pumping and generation of electricity. Reciprocating pumps used for pumping water, their capacity. The characteristics of generators for coupling with wind mills, storage of wind energy. Relay devices used for electricity storage system.	
03.05	<b><u>Maintenance of wind mills, pumps, generator and energy storage.</u></b>	20
04	Bio-Gas Energy	..
04.01	Principle of bio-gas production, chemical and microbiological process. Termination parameters, air-tightness, temperature, PH value, C/N ratio, solid content, loading rate, retention time and mixing. Different feed stocks for bio-gas generation, live-stock wastes, right soil, plant waste, industrial and municipal wastes, classification of designs based on methods of digestion and gas storage. Selection of size, specification, site selection and installation of the plant. Water removal devices, maintenance of plants, general troubles in operation and their remedies, utilization of bio-gas and manure fuel characteristics, bio-gas stoves, lamps and engines. Modification of engines to run on bio-gas. Disposal of slurry and utilization of sludges in agriculture, purification of bio-gas, its storage, transportation and environmental effects and cost benefit.	



05	Bio-Gas Technology	06	..
05.01	Modification of Gobar gas plants to use night soil and kitchen garbage.		

**Recommended Books**

<b>SL</b>	<b>Title/Publisher</b>	<b>Author</b>
1.	Use of Solar Energy, Khanna Publications, New Delhi - 6	Yomen
2.	Marval of Wind Mills, Institute of Engg and Rural Technology pbl. Allahabad.	-
3.	Gobar Gas Plant, Khadi Village Commission	-
4.	Bio-gas Technology (A Practical handbook) Khandelwal and S.S. Mandi	K.C.
5.	Bio-gas Technology (Achievements and Challenges) Sathinathan	M.A.
6.	Appropriate Technology Development Association of India, Appropriate Technology Centre Publication, Lucknow.	-
7.	Invention Intelligence, Science Reports, Science Digest	-
8.	Publication of the Intermediate Technology Development Association of London	-
9.	Publication of K.V.I.O., Vile Parle, Bombay.	-
10.	Publication of Institute of Engineering and Rural Technology, Allahabad.	-

# SOIL MECHANICS

<b>Subject Code</b> <b>15305</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>04</b>			<b>Internal Exam.</b>	<b>:</b>	<b>20</b>

## Rationale & Objective:

Soil Mechanics is a well recognized subject of Civil Engineering now a days and its study is considered essential for technicians in effective execution and maintenance of a number of Civil Engineering activities like foundation, rigid and flexible pavements, underground dams etc. the mission of technical education is to develop technical man-power which can be utilized for effective and efficient implementation of modern Civil Engineering Projects by theoretical and practical analysis of soil under project area. For fulfillment of this primary objective, the following topics with the contents are included in this curriculum. This curriculum will be able to generate multiple effects in developing knowledge as well as appropriate skill of technicians and it will be helpful in creation of attitude of this towards application of Soil Mechanics in Civil Engineering works for strength and durability of the structures.

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Introduction	(02)
02	Basic Properties of Soil	(05)
03	Determination of Index Properties of Soil	(07)
04	Classification of Soil	(04)
05	Soil Structure	(03)
06	Permeability	(06)
07	Compaction	(04)
08	Shear Strength of Soil	(04)
09	Earth Pressure	(06)
10	Bearing Capacity	(05)
11	Foundation Engineering	(08)
12	Miscellaneous Topics	(06)
<b>Total :</b>		<b>(60)</b>

## CONTENTS:

### **TOPIC: 01 – INTRODUCTION:**

01.01	Basic concept of Soil and its formation.	
01.02	Definition of Soil Mechanics & its application in Civil Engineering Works.	
01.03	Acquaintance with Indian Soil in general & Soil of Bihar in particular	<b>[02]</b>

### **TOPIC: 02 – BASIC PROPERTIES OF SOIL:**

02.01	Soil mass as a three phase system.	
02.02	Definition and brief explanation of Water content, unit weights, specific gravity, void ratio, Porosity, degree of saturation, percentage of air voids, air content and Density index.	
02.03	Functional Relationship among above parameters.	
02.04	Numerical problems based on above topics.	<b>[05]</b>

### **TOPIC: 03 – DETERMINATION OF INDEX PROPERTIES OF SOIL:**

03.01	Water content determination by (i) oven drying methods, (ii) Sand Bath Method and (iii) Pycnometer method.	
03.02	Laboratory Method for determination of Specific gravity.	
03.03	Particle Size Distribution-Basic Concept.	
03.03.01	Methodology of Sieve analysis.	
03.03.02	Sedimentation Analysis-Theory and Limitation, Stoke's law	
03.03.03	Methods of Sedimentation Analysis.	
	(i) Pipette Method	
	(ii) Hydrometer Method	
03.04	Consistency of Soil-Brief idea including Atterberg limits.	
03.04.01	Fundamental concept of Liquid limit, plastic limit & shrinkage limit and their determination in the laboratory.	
03.04.02	Simple idea of plasticity, consistency index. Shrinkage ratio, Volumetric Shrinkage and linear Shrinkage.	
03.05	Simple Numerical Problems related to above topics.	<b>[07]</b>

**TOPIC: 04 – CLASSIFICATION OF SOIL:** [04]

- 04.01 Objects of Classification.
- 04.02 Properties of Soil Classification.
- 04.03 System of Soil Classification :-
  - (i) Particle Size Classification
  - (ii) Textural Classification.
  - (iii) Highway Research Board Classification
  - (iv) Indian Soil Classification

[03]

**TOPIC: 05 – SOIL STRUCTURE:**

- 05.01 Brief introduction of soil structure and inter particle forces in a soil mass.
- 05.02 Particle arrangement in coarse grained soil, clays & composite soils

**TOPIC: 06 – PERMEABILITY:** [06]

- 06.01 Introduction-Discharge Velocity & Seepage Velocity.
- 06.02 Head, Gradient & Potential.
- 06.03 Darcy's law and its limitations.
- 06.04 Factors affecting permeability.
- 06.05 Laboratory methods for determination of coefficient of permeability-Constant head & falling head methods.
- 06.06 Simple Numerical Problems on above topics.

**TOPIC: 07 – COMPACTION:** [04]

- 07.01 Theory of Compaction and factors influencing compacted density of soil.
- 07.02 Brief description of laboratory tests related to compaction of soil-Standard Proctor test & Modified Standard Proctor Test.
- 07.03 Effect of Compaction on Soil Properties.

**TOPIC: 08 – SHEAR STRENGTH OF SOIL:** [04]

- 08.01 Brief idea of Shear strength and Stress Analysis by Mohr's Circle.
- 08.02 Mohr-Coulomb Failure Theory.
- 08.03 Measurement of Shear Strength of soil by
  - (i) Direct Shear Test
  - (ii) Triaxial Compression Test.

**TOPIC: 09 – EARTH PRESSURE:** [06]

- 09.01 Basic Concept of active earth pressure, Passive earth pressure and Earth pressure at rest.
- 09.02 Rankine's theory-its assumptions and application in the determination of active earth pressure for the following cases:-
  - (i) Dry backfill with no surcharge
  - (ii) Submerged backfill
  - (iii) Backfill with uniform surcharge.
  - (iv) Cohesive soil
- 09.03 Application of Rankine's theory for determining passive earth pressure in the following cases:-
  - (i) Cohesionless Backfill.
  - (ii) Cohesive Backfill.
- 09.04 Basic Numerical problems on above topics

**TOPIC: 10 – BEARING CAPACITY:** [05]

- 10.01 Definition of bearing capacity, Gross pressure intensity, Net pressure intensity, ultimate bearing capacity, Net ultimate bearing capacity, Net safe bearing capacity and allowable bearing pressure etc.
- 10.02 Rankine's Analysis for determination of minimum depth of foundation.
- 10.03 Terzaghi's Analysis-Assumptions & Limitations.
- 10.03.01 Derivation of Terzaghi's general bearing capacity equation for continuous footing and basic numerical problems associated with it.

**TOPIC: 11 – FOUNDATION ENGINEERING:** [08]

- 11.01 Pile Foundations-Common types of piles.
  - 11.01.01 Pile Driving-types of hammer
  - 11.01.02 Load carrying capacity of piles by static & dynamic formulae-Basic numerical problems related to it.
  - 11.01.03 Pile Load Test & Cycle Load Test.
  - 11.01.04 Group Action in Pile-Efficiency of Pile group & settlement of pile group in clay.

- 11.01.05 Under-reamed Pile.  
 11.02 Well Foundation.  
 11.02.01 Caissons  
 11.02.02 Shapes of Well with component parts.  
 11.02.03 Depth of well foundation & expression for bearing capacity.  
 11.02.04 Forces acting on a well foundation.

**TOPIC: 12 – MISCELLANEOUS TOPICS:**

[06]

- 12.01 Clay Mineralogy- Kaolinite, Montmorillonite & Illite, Minerals of clay.  
 12.02 Consolidation and coefficient of consolidation.  
 12.02.01 Difference between compaction  
 12.03 Soil Stabilisation- Brief introductions.  
 12.03.01 Different Methods of Soil Stabilisation:-  
 (i) Mechanical Stabilisation Method  
 (ii) Cement Stabilisation Method  
 (iii) Lime Stabilisation Method  
 (iv) Bitumen Stabilisation Method  
 (v) Stabilisation by heating Method  
 (vi) Electrical Stabilisation Method  
 12.04 Types of Soil Samples-Disturbed & Undisturbed samples.  
 12.04.01 Procuring and handing of Disturbed and Undisturbed samples.  
 12.04.02 Types of Samplers- Open, Drive, Stationary piston and rotary sampler.

**Books Recommended:**

1. Soil Mechanics & Foundation Engineering Standard Book - Dr. B. C. Punamia  
House, Delhi – 110006
2. Soil Engineering in Theory and Practice Volume 1 & 2. C. - Dr. G. R. Choudhary  
B. S. Publishers & Distributors, Delhi-110006
3. Engineering Properties of Soil. T. M. H. - S. K. Gulati
4. Soil Mechanics & Foundation Engineering, Khanna - S. K. Gerg  
Publishers, Delhi- 110006
5. Soil Testing, Khanna Publishers, Delhi -110006 - S. Mithal
6. Problems on Soil Mechanics, khanna Publishers, Delhi- - B. P. Verma  
110006
7. Soil Mechanics & Foundation Engineering, Standard - K. R. Arora  
Publishers Distributors, Delhi- 110006
8. मृदा यांत्रिकी एवं नींव इंजिनियरी, Standard Publishers - भगीरथ लाल गुप्ता  
Distributors, Delhi- 110006
9. मृदा यांत्रिकी - डॉ. जे. झा
10. Relevant B. I. S. Codes -

## 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 analyse 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                           | . | जे. के. कपूर    |
| 2. Strength of Materials                           | - | Bininder Singh  |
| 3. Mechanics of Structure, Vol. I                  | - | 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                        |

# DEMONSTRATION OF NON-CONVENTIONAL ENERGY DEVICES

<b>Subject Code</b>  <b>06308</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>Internal Exam.</b>	<b>:</b>	<b>10</b>

## Rationale

In near future the fossil fuels are going to be exhausted, where as the consumption and demand is increasing day by day. In the turn of country there is going to be energy crisis, there will be left with no option expect to switch over to non-conventional energy source, such as Solar Energy, Biomass Energy etc. The rural technician should be given sufficient exposure to these alternation energy sources, so that, they can appreciate, adopt and maintain these sources.

## Objectives

The technician will be able to adopt and use the alternate energy sources. They will be able to repair and maintain these alternative Energy systems. They can motivate the rural mass to adopt these energy sources also.

## **LIST OF SESSIONALS**

### **SL      Topics**

1. Demonstration of small scale Gobar Gas and Demonstration of its use in gas Lighting, Heating and Running Gas Engines.
2. Demonstration of Solar Cooker, Water Heater, Distilled Water Plant, Solar Lantern and Street Lighting.
3. Demonstration of wind Mills for drinking water lifting, Devices-Electric Generation, etc.
4. Demonstration of Propeller's for rotating a shaft by flowing water.

### **Recommended Books**

#### **SL      Title/Publisher**

1. The Generation of Electricity by Wind Power
2. Energy Today and Tomorrow
3. Solar Energy - Principles of Thermal Collection and Storage, Tata McGraw Hills
4. Biogas Technology, Tata McGraw Hills
5. Energy Resources and Supply, John Willey Publication

#### **Author**

- E. W. Golding  
Maheshwari Dayal, Ex-Minister,  
Govt. of India
- S. P. Sukhlali,  
IIT Bombay  
K. C. Khandelwal, S. S. Mahdi  
J. T. Mcmillan, R. Morgan and R.  
B. Murray

## SOIL MECHANICS Lab.

<b>Subject Code</b> <b>15309</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:

The Soil Mechanics Laboratory is essential as soil possesses a variety of physical properties, most of which are not constant. This diversity in the nature of the soil needs experimental analysis of the soil to be performed by the technicians. For this purpose, the present curriculum envisages the skill development of the technicians in performing experiments as well as the presentation and analysis of the experimental data. It will be helpful in building confidence among the technicians in selecting/designing the appropriate components of Civil Engg. works.

### CONTENTS

#### Preparation of Journal based on any eight experiments of the following:

- 01 Determination of water content by Oven Drying Method.
- 02 Determination of water content by Sand Bath Method.
- 03 Determination of Specific gravity of soil by Density Bottle.
- 04 Determination of Specific gravity of soil by Pycnometer.
- 05 Determination of Field Density by Water Displacement Method.
- 06 Determination of Field Density by Core Cutter Method.
- 07 Determination of Field Density by Sand Replacement Method.
- 08 Determination of Grain Size Distribution by Sieving.
- 09 Determination of Grain Size Distribution by Hydrometer.
- 10 Determination of Liquid Limit of Soil.
- 11 Determination of Plastic Limit of Soil.
- 12 Determination of Shrinkage Limit of Soil.
- 13 Determination of Permeability by Constant Head Test.
- 14 Determination of Permeability by Falling Head Test.
- 15 Determination of Compaction of Soil by Standard Proctor Test.
- 16 Determination of Compaction of Soil by Modified Proctor Test.

### Books Recommended:

#### Text Books

1. Soil Mechanics & Foundation Engineering, Standard Book House, Delhi-110006 - Dr. B. C. Punamia
2. Soil Engineering in Theory and Practice Volume-1 & 2, C. B. S. Publishers & Distributors, Delhi-110006 - Dr. Alam Singh & Dr. G. R. Choudhary
3. Engineering Properties of Soil, T. M. H. - S. K. Gulati
4. Soil Mechanics & Foundation Engineering, Khanna Publishers, Delhi-110006 - S. K. Gerg
5. Soil Testing, Khanna Publishers, Delhi-110006 - S. Mithal
6. Problems on Soil Mechanics, Khanna Publishers, Delhi-110006 - B. P. Verma
7. Soil Mechanics & Foundation Engineering, Standard Publishers Distributors, Delhi-110006 - K. R. Arora
8. मृदा यांत्रिकी एवं नींव इंजिनियरी, Standard Publishers Distributors, Delhi-110006 - भगोरथ लाल गुप्ता
9. मृदा यांत्रिकी - डॉ. जे. झा
10. Relevant B. I. S. Codes -