



No. 39309 Date 6/9/18

To  
Principals of All Polytechnics

Sub: Final Revised syllabus of 1<sup>st</sup> & 2<sup>nd</sup> semester w.e.f 2018-19 session

Sir,

In continuation to this office letter No. 3684 dt. 16.8.2018, I am to say that, after discussion in the Polytechnic Principals' meeting held on 25/8/2018, and subsequent deliberations in the council, the final revised Syllabus for 1<sup>st</sup> & 2<sup>nd</sup> semester Diploma Engineering courses effective from 2018-19 session is hereby circulated with the following changes in the norms and contents. This syllabus shall be applicable for all diploma courses approved by AICTE, New Delhi under Engineering and Technology Programme and affiliated to this council w.e.f. 2018-19.

1. The conditions on selection of subjects specified in the above letter is hereby relaxed. Individual institution can select the subjects, where alternatives are available depending on the students strength and varieties of branches available with them, subject to condition that all students of a particular branch shall be offered only one of the alternative subjects and no part of students in a branch can be offered different alternative subject. The Institutions are to upload the subjects offered for different branches in SCTE&VT web portal to be notified in due course of time, so that the same can be followed from coming 1<sup>st</sup> semester onwards.
2. Engg. Mechanics and Basic Electrical Engg. & Electronics Engg. shall be offered as alternate to each other in both 1<sup>st</sup> & 2<sup>nd</sup> semester to be selected by the institute.
3. Subject contents of Communicative English, Basic Electrical & Electronics Engineering have been partially modified.
4. The Total Marks in a semester have been made as 750

Lateral Entry students admitted during 2018-19 shall appear the subjects of 1<sup>st</sup> and 2<sup>nd</sup> semester like previous year.

The students should be encouraged to undergo Internship Training during Summer Vacation to enhance their Skill and Employability.

Encl: As above

Yours faithfully

Controller of Examination

# STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

## TEACHING AND EVALUATION SCHEME FOR 1st Semester (COMMON TO ALL ENGINEERING COURSES)(wef 2018-19)

Subject Code	Subject	Periods/week			Evaluation Scheme			
		L	T	P	Mid Sem Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
	Theory							
Th.1a Th.1b	Communicative English <b>OR</b> Computer Application	4	-	-	20	80	3	100
Th.2a Th.2b	Engineering Physics <b>OR</b> Enggineering Chemistry	4	-	-	20	80	3	100
Th.3	Engineering Mathematics-I	5	1	-	20	80	3	100
Th.4 Th.4a&b	Engg. Mechanics <b>OR</b> Basic Electrical & Electronics Engg.	4			20	80	3	100
	<i>Total</i>	17	-		80	320	-	400
	Practical							
Pr.1a Pr.1b	Comm. English Lab <b>OR</b> Computer application Lab	-	-	4	50	-	-	50
Pr.2a Pr.2b	Engg. Physics Lab <b>OR</b> Engg. Chemistry Lab	-	-	4	50	50	3	100
Pr.3a Pr.3b	Engineering Drawing <b>OR</b> Workshop Practice	-	-	6	50	100	3 4	150
Pr.4	Seminar			4	50			50
	Student Centred Activities(SCA)		-	3	-	-	-	-
	<i>Total</i>	-	-	21	200	150	-	350
	<b>Grand Total</b>	<b>17</b>	<b>1</b>	<b>21</b>	<b>280</b>	<b>470</b>	<b>-</b>	<b>750</b>
Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration								
Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%								
SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies etc. Seminar and SCA shall be conducted in a section.								
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester								
In Th.4a&b Basic Electrical & Electronics Engg. paper there shall be examination in separate Answer books for Th.4a Basic Electrical Engg. and Th.4b Basic Elecnronics Engg. in the same sitting								

**STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA**

**TEACHING AND EVALUATION SCHEME FOR 2nd Semester (COMMON TO ALL ENGINEERING COURSES)(wef 2018-19)**

Subject Code	Subject	Periods/week			Evaluation Scheme			
		L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
	Theory							
Th.1a Th.1b	Communicative English <b>OR</b> Computer Application	4	-	-	20	80	3	100
Th.2a Th.2b	Engineering Physics <b>OR</b> Enggineering Chemistry	4	-	-	20	80	3	100
Th.3	Engineering Mathematics-II	5	1	-	20	80	3	100
Th.4 Th.4a&b	Engg. Mechanics <b>OR</b> Basic Electrical & Electronics Engg.	4			20	80	3	100
	<i>Total</i>	<i>17</i>	<i>1</i>		<i>80</i>	<i>320</i>	<i>-</i>	<i>400</i>
	<b>Practical</b>							
Pr.1a Pr.1b	Comm. English Lab <b>OR</b> Computer application Lab	-	-	4	50	-	-	50
Pr.2a Pr.2b	Engg. Physics Lab <b>OR</b> Engg. Chemistry Lab	-	-	4	50	50	3	100
Pr.3a Pr.3b	Engineering Drawing <b>OR</b> Workshop Practice	-	-	6	50	100	3 4	150
Pr.4	Seminar			4	50			50
	Student Centred Activities(SCA)		-	3	-	-	-	-
	<i>Total</i>	<i>-</i>	<i>-</i>	<i>21</i>	<i>200</i>	<i>150</i>	<i>-</i>	<i>350</i>
	<b>Grand Total</b>	<b>17</b>	<b>1</b>	<b>21</b>	<b>280</b>	<b>470</b>	<b>-</b>	<b>750</b>

Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

**Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%**

**SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies etc. Seminar and SCA shall be conducted in a section.**

**There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester**

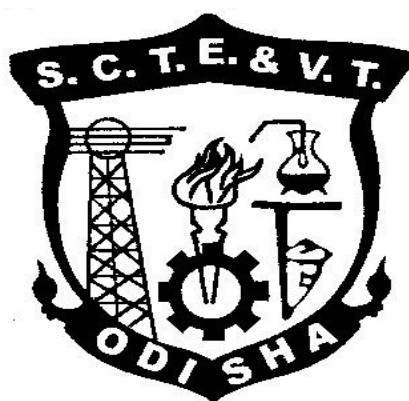
**In Th.4a&b Basic Electrical & Electronics Engg. paper there shall be examination in separate Answer books for Th.4a Basic Electrical Engg. and Th.4b Basic Electronics Engg. in the same sitting**

# **CURRICULLUM OF 1<sup>ST</sup> & 2<sup>ND</sup> SEMESTER**

**For**

**DIPLOMA IN ENGINEERING**

**(Effective FROM 2018-19 Session)**



**STATE COUNCIL FOR TECHNICAL EDUCATION  
& VOCATIONAL TRAINING, ODISHA,  
BHUBANESWAR**

## Th.1a. COMMUNICATIVE ENGLISH

(1<sup>st</sup> & 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
 Total Periods: 60 Periods  
 Examination: 3 Hours

I.A : 20 Marks  
 Term End Exam : 80 Marks  
 TOTAL MARKS : 100 Marks

### Topic- wise distribution of periods with marks

S.L. No.	Topics	Periods
I	Literature Appreciation	20
II	Vocabulary	05
III	Application of Grammar	08
IV	Formal writing skills	15
V	Elements of communication	12
	• Introduction to communication	
	• Professional communication	
	• Nonverbal communication	
	Total	60

### OBJECTIVE

To comprehend the given passage  
 To answer correctly the questions on seen and unseen passages  
 To increase the vocabulary  
 To apply rules of grammar for flawless writing  
 To understand and use the basic concepts of communication in an organized set up and social context  
 To give a positive feedback in various situation, to use appropriate body language and to avoid barrier for effective communication  
 To improve writing skill

### Unit-I

#### LITERATURE APPRECIATION

##### 1. Reading comprehension

Sub-skills of reading comprehension are to be worked out and tested through an unseen passage in about 200-500 words.

A student should get acquainted with sub-skills of reading for the purpose of:

- Skimming the gist
- Scanning for necessary information
- Close reading for inference and evaluation
- Main idea and supporting points
- Guessing the meaning of un-familiar words
- Note- making
- Summarizing
- Supplying a suitable title

##### 2. Text

The following chapter from “**Invitation to English**”, **Book-1** for +2 students of CHSE, Odisha.**2016 reprint** to be covered in class room:

- **Standing Up For Yourself** By Yevgeny Yevtushenko

- **The Magic Of Teamwork** By Sam Pitroda
- **Inchcape Rock** By Robert Southey
- **To My True Friend** By Elizabeth Pinard

The student is to answer comprehension questions from these chapters in the end examination.

## **UNIT- II**

### **VOCABULARY**

Use of synonyms, antonyms

- Same word used in different situations in different meaning
- Single word substitute

## **Unit-III**

### **APPLICATION OF ENGLISH GRAMMAR**

- Countable and Uncountable Noun
- Articles and Determiners
- Modal Verbs
- Tenses
- Voice-change
- Subject-verb Agreement

## **UNIT-IV**

### **FORMAL WRITING SKILLS**

1. Paragraph writing
  - Meaning
  - Features of Paragraph Writing ( Topic Statement, Supporting Points and Plot Compatibility)
  - Developing Ideas into Paragraphs ( Describing Place/ Person/ Object /Situation and any general topic of interest)
2. Notice
3. Agenda
4. Report writing (Format of a Report, Reporting an event / news)
5. Writing personal letter
6. Letter to the Principal, Librarian, Head of the Deptt, and Hostel Superintendent
7. Writing Business letters
  - Layout of a Business Letter
  - Letter of Enquiry, Placing an Order, Execution of an Order, Complaint, Cancellation of an order(Features, Format and example)
8. Job application and C.V.(Features, Format and example)

## **UNIT-V**

### **ELEMENTS OF COMMUNICATION**

#### **A. Introduction to Communication**

1. Meaning, Definition and concept of communication
2. Good Communication and Bad Communication
3. Communication model
  - One-way Communication Model and Two-way Communication Model with examples
4. Process of communication and factors responsible for it
  - Sender, Message, Channel, Receiver / Audience, Feedback, Noise, Context

#### **B. Professional Communication**

1. Meaning of professional communication
2. Types of professional communication
  - 2.1. Formal or Systematic Communication
    - Upward communication (How it takes place, symbol, merits and demerits)
    - Down-ward communication (How it takes place, symbol, merits and demerits)

- Parallel communication (How it takes place, symbol, merits and demerits)
- 2.2. Informal communication
- Grape vine communication (How it takes place, symbol, merits and demerits)

#### **D. Non- Verbal Communication**

1. Meaning of nonverbal Communication

2. Different areas of Non-verbal Communication

- Kinesics or Body Language (Postures and Gestures, Facial Expression and Eye Contact)
- Proxemics or Spatial Language (Private Space, Personal Space, Social Space, Public Space)
- Language of Signs and Symbols (Audio Sign and Visual Sign in everyday life with merits and demerits)

#### **Syllabus Coverage up to I.A**

1. Reading Comprehension
2. Standing Up by Yourself
3. Use of Synonyms and Antonyms
4. Notice
5. Agenda

#### **Books Recommended:**

Invitation to English, Book-1, (for +2 students), CSHE (2016 reprint), Odisha  
 Invitation to English, Book-2, (for +2 students), CSHE (2016 reprint), Odisha  
 Invitation to English, Book-3, (for +2 students), CSHE (2016 reprint), Odisha  
 Invitation to English, Book-4, (for +2 students), CSHE (2016 reprint), Odisha  
 Wren and Martin High School English Grammar, Dr. NDV Prasad Rao, S. Chand Publication  
 Communication Skills, Sanjay Kumar and Puspallata, Oxford University Press

## Th.1b. COMPUTER APPLICATION

(1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods  
Examination: 3 Hours

I.A : 20 Marks  
End Sem Exam : 80 Marks  
TOTAL MARKS : 100 Marks

### Objective:

The students will get to know about the fundamentals of computer. They will get acquainted with various components of computer hardware, software etc. Idea on Role of operating system and its usability will also be known. Knowledge on word processing, electronic spreadsheet, presentation software and Internet will also be acquired. The students will be given brief knowledge about Programming methodology and C programming.

### Topic wise distribution of periods

Sl. No.	Topics	Periods
1	Computer Organisation	05
2	Computer Software	07
3	Computer Network and Internet	08
4	File Management and Data Processing	05
5	Problem Solving Methodology	05
6	Overview of C Programming language	15
7	Advanced features of C	15
	<b>TOTAL</b>	<b>60</b>

### 1. COMPUTER ORGANISATION

Introduction to Computer Evolution of Computers Generation of Computers Classification of Computers  
Basic Organisation of Computer (Functional Block diagram) Input Devices, CPU & Output Devices.  
Computer Memory and Classification of Memory

### 2. COMPUTER SOFTWARE

Software concept, System software, Application software  
Overview of Operating System Objectives and Functions of O.S ,  
Types of Operating System: Batch Processing, Multiprogramming, Time Sharing OS  
Features of DOS, Windows and UNIX  
Programming Languages Compiler, interpreter Computer Virus  
Different Types of computer virus  
Detection and prevention of Virus  
Application of computers in different Domain

### 3. COMPUTER NETWORK AND INTERNET

Networking concept, Protocol, Connecting Media, Data Transmission mode  
Network Topologies, Types of Network  
Networking Devices like Hub, Repeater, Switch, Bridge, Router, Gateway & NIC  
Internet Services like E-Mail, WWW, FTP, Chatting, Internet Conferencing,  
Electronic Newspaper & Online Shopping  
Different types of Internet connectivity and ISP



#### **4. FILE MANAGEMENT AND DATA PROCESSING**

Concept of File and Folder  
File Access and Storage methods. Sequential, Direct, ISAM  
Data Capture, Data storage  
Data Processing and Retrieval

#### **5. PROBLEM SOLVING METHODOLOGY**

Algorithm, Pseudo code and Flowchart Generation of Programming Languages  
Structured Programming Language  
Examples of Problem solving through Flowchart

#### **6. OVERVIEW OF C PROGRAMMING LANGUAGE**

Constants, Variables and Data types in C Managing Input and Output operations.  
Operators, Expressions, Type conversion & Typecasting  
Decision Control and Looping Statements (If, If-else, If-else-if, Switch, While, Do-while, For, Break, Continue & Goto)  
Programming Assignments using the above features.

#### **7. ADVANCED FEATURES OF C**

Functions and Passing Parameters to the Function (Call by Value and Call by Reference) Scope of Variables and Storage Classes  
Recursion Function and Types of Recursion  
One Dimensional Array and Multidimensional Array  
String Operations and Pointers  
Pointer Expression and Pointer Arithmetic Programming Assignments using the above features. Structure and Union (Only concepts, No Programming)

### **Syllabus coverage upto I.A**

Chapter- 1,2 3,4

#### **Books Recommended**

1. Computer Fundamentals and Programming in C by Reema Thareja, Oxford University Press
2. Programming in ANSI C by A.N Kamthane, Pearson Education
3. Computer Application by Kalyani Publisher
4. Let us C by Y. Kanetkar, BPB
5. Computer Fundamentals, by E. Balaguruswamy, TMH

## Th.2a. Engineering Physics

### (1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods  
Examination: 3 Hours

I.A: 20 Marks  
End Sem Exam : 80 Marks  
TOTAL MARKS : 100 Marks

Unit	Topic	No. of periods
1	UNITS & DIMENSIONS	03
2	SCALARS & VECTORS	03
3	KINEMATICS	06
4	WORK & FRICTION	05
5	GRAVITATION	05
6	OSCILLATIONS & WAVES	06
7	HEAT & THERMODYNAMICS	07
8	OPTICS	04
9	ELECTROSTATICS & MAGNETOSTATICS	07
10	CURRENT ELECTRICITY	06
11	ELECTROMAGNETISM & ELECTROMAGNETIC INDUCTION	05
12	MODERN PHYSICS	03
TOTAL :		60 Periods

### **UNIT 1 - UNITS AND DIMENSIONS**

- 1.1 Physical quantities - (Definition).
- 1.2 Definition of fundamental and derived units, systems of units (FPS, CGS, MKS and SI units).
- 1.3 Definition of dimension and Dimensional formulae of physical quantities.
- 1.4 Dimensional equations and Principle of homogeneity.
- 1.5 Checking the dimensional correctness of Physical relations.

### **UNIT 2 - SCALARS AND VECTORS**

- 2.1 Scalar and Vector quantities (definition and concept), Representation of a Vector – examples, types of vectors.
- 2.2 Triangle and Parallelogram law of vector Addition (Statement only). Simple Numerical.
- 2.3 Resolution of Vectors – Simple Numericals on Horizontal and Vertical components.
- 2.4 Vector multiplication (scalar product and vector product of vectors).

### **UNIT 3 - KINEMATICS**

- 3.1 Concept of Rest and Motion.
- 3.2 Displacement, Speed, Velocity, Acceleration & FORCE (Definition, formula, dimension & SI units).
- 3.3 Equations of Motion under Gravity (upward and downward motion) - no derivation.
- 3.4 Circular motion: Angular displacement, Angular velocity and Angular acceleration (definition, formula & SI units).
- 3.5 Relation between –(i) Linear & Angular velocity, (ii) Linear & Angular acceleration).
- 3.6 Define Projectile, Examples of Projectile.
- 3.7 Expression for Equation of Trajectory, Time of Flight, Maximum Height and Horizontal Range for a projectile fired at an angle, Condition for maximum Horizontal Range.

#### **UNIT 4 – WORK AND FRICTION**

- 4.1 Work – Definition, Formula & SI units.
- 4.2 Friction – Definition & Concept.
- 4.3 Types of friction (static, dynamic), Limiting Friction (Definition with Concept).
- 4.4 Laws of Limiting Friction (Only statement, No Experimental Verification).
- 4.5 Coefficient of Friction – Definition & Formula, Simple Numericals.
- 4.6 Methods to reduce friction.

#### **UNIT 5 - GRAVITATION**

- 5.1 Newton's Laws of Gravitation – Statement and Explanation.
- 5.2 Universal Gravitational Constant (G)- Definition, Unit and Dimension.
- 5.3 Acceleration due to gravity (g)- Definition and Concept.
- 5.4 Definition of mass and weight.
- 5.5 Relation between g and G.
- 5.6 Variation of g with altitude and depth (No derivation – Only Explanation).
- 5.7 Kepler's Laws of Planetary Motion (Statement only).

#### **UNIT 6 - OSCILLATIONS AND WAVES**

- 6.1 Simple Harmonic Motion (SHM) - Definition & Examples.
- 6.2 Expression (Formula/Equation) for displacement, velocity, acceleration of a body/ particle in SHM.
- 6.3. Wave motion – Definition & Concept.
- 6.4 Transverse and Longitudinal wave motion – Definition, Examples & Comparison.
- 6.5 Definition of different wave parameters (Amplitude, Wavelength, Frequency, Time Period.
- 6.6 Derivation of Relation between Velocity, Frequency and Wavelength of a wave
- 6.7 Ultrasonics – Definition, Properties & Applications.

#### **UNIT 7 - HEAT AND THERMODYNAMICS**

- 7.1 Heat and Temperature – Definition & Difference
- 7.2 Units of Heat (FPS, CGS, MKS & SI).
- 7.3 Specific Heat (concept, definition, unit, dimension and simple numerical)
- 7.4 Change of state (concept), Latent Heat (concept, definition, unit, dimension and simple numerical)
- 7.5 Thermal Expansion – Definition & Concept
- 7.6 Expansion of Solids (Concept)
- 7.7 Coefficient of linear, superficial and cubical expansions of Solids – Definition & Units.
- 7.8 Relation between  $\alpha$ ,  $\beta$  &  $\gamma$
- 7.9 Work and Heat - Concept & Relation.
- 7.10 Joule's Mechanical Equivalent of Heat (Definition, Unit)
- 7.11 First Law of Thermodynamics (Statement and concept only)

#### **UNIT 8 – OPTICS**

- 8.1 Reflection & Refraction – Definition.
- 8.2 Laws of reflection and refraction (Statement only)
- 8.3 Refractive index – Definition, Formula & Simple numerical.
- 8.4 Critical Angle and Total internal reflection – Concept, Definition & Explanation
- 8.5 Refraction through Prism (Ray Diagram & Formula only – NO derivation)..
- 8.6 Fiber Optics – Definition, Properties & Applications.

#### **UNIT 9 – ELECTROSTATICS & MAGNETOSTATICS**

- 9.1 Electrostatics – Definition & Concept.
- 9.2 Statement & Explanation of Coulombs laws, Definition of Unit charge.
- 9.3 Absolute & Relative Permittivity ( $\epsilon$ ) – Definition, Relation & Unit.

- 9.4 Electric potential and Electric Potential difference (Definition, Formula & SI Units).
- 9.5 Electric field, Electric field intensity (E) – Definition, Formula & Unit.
- 9.6 Capacitance - Definition, Formula & Unit.
- 9.7 Series and Parallel combination of Capacitors (No derivation, Formula for effective/Combined/total capacitance & Simple numericals).
- 9.8 Magnet, Properties of a magnet.
- 9.9 Coulomb's Laws in Magnetism – Statement & Explanation, Unit Pole (Definition).
- 9.10 Magnetic field, Magnetic Field intensity (H) - (Definition, Formula & SI Unit).
- 9.11 Magnetic lines of force ( Definition and Properties)
- 9.12 Magnetic Flux ( $\Phi$ ) & Magnetic Flux Density (B) – Definition, Formula & Unit.

### **UNIT 10 – CURRENT ELECTRICITY**

- 10.1 Electric Current – Definition, Formula & SI Units.
- 10.2 Ohm's law and its applications.
- 10.3 Series and Parallel combination of resistors (No derivation, Formula for effective/ Combined/ total resistance & Simple numericals).
- 10.4 Kirchhoff's laws (Statement & Explanation with diagram).
- 10.5 Application of Kirchhoff's laws to Wheatstone bridge - Balanced condition of Wheatstone's Bridge – Condition of Balance (Equation).

### **UNIT 11 – ELECTROMAGNETISM & ELECTROMAGNETIC INDUCTION**

- 11.1 Electromagnetism – Definition & Concept.
- 11.2 Force acting on a current carrying conductor placed in a uniform magnetic field, Fleming's Left Hand Rule
- 11.3 Faraday's Laws of Electromagnetic Induction (Statement only)
- 11.4 Lenz's Law (Statement)
- 11.5 Fleming's Right Hand Rule
- 11.6 Comparison between Fleming's Right Hand Rule and Fleming's Left Hand Rule.

### **UNIT 12 - MODERN PHYSICS**

- 12.1 LASER & laser beam (Concept and Definition)
- 12.2 Principle of LASER (Population Inversion & Optical Pumping)
- 12.3 Properties & Applications of LASER
- 12.4 Wireless Transmission – Ground Waves, Sky Waves, Space Waves ( Concept & Definition)

### **RECOMMENDED BOOKS**

- 1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
- 2. Text Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T
- 3. Text Book of Engineering Physics by Barik, Das, Sharma, Kalyani Publisher
- 4. Concepts in Physics by H. C. Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi

### **Syllabus coverage upto I.A**

Units 1,2,3,4,5,6

## Th.2b. Engineering Chemistry

(1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods  
Examination: 3 Hours

I.A : 20 Marks  
Term End Exam : 80 Marks  
TOTAL MARKS : 100 Marks

### Objective:

Engineering Chemistry is concerned with the changes of matters with its environment and an ever growing subject. So, the aim of teaching Engineering Chemistry in Diploma Courses is to acquaint the students with the basic Chemistry of different materials used in industry and to equip the students with the basic principles of chemical changes taking place in different aspects connected to engineering fields. They also develop the right attitude to cope up with the continuous flow of new technology.

### Topic wise distribution of periods

Sl. No	Topics/ Units	Periods
A	Physical Chemistry	22
B	Inorganic Chemistry	08
C	Organic Chemistry	10
D	Industrial Chemistry	20
	<b>TOTAL</b>	<b>60</b>

### A. PHYSICAL CHEMISTRY

**Chapter 1: Atomic structure** : Fundamental particles ( electron, proton & neutron Definition, mass and charge ). Rutherford's Atomic model ( postulates and failure), Atomic mass and mass number, Definition, examples and properties of Isotopes, isobars and isotones. Bohr's Atomic model ( Postulates only), Bohr-Bury scheme, Aufbau's principle, Hund's rule, Electronic configuration (up to atomic no 30).

**Chapter 2 : Chemical Bonding** : Definition , types ( Electrovalent, Covalent and Coordinate bond with examples ( formation of NaCl, MgCl<sub>2</sub>, H<sub>2</sub>, Cl<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>O, CH<sub>4</sub>, NH<sub>3</sub>, NH<sub>4</sub><sup>+</sup>, SO<sub>2</sub> ).

**Chapter 3 : Acid base theory** : Concept of Arrhenius, Lowry Bronsted and Lewis theory for acid and base with examples ( Postulates and limitations only). Neutralization of acid & base. Definition of Salt, Types of salts ( Normal, acidic, basic, double, complex and mixed salts, definitions with 2 examples from each).

**Chapter 4: Solutions** : Definitions of atomic weight, molecular weight, Equivalent weight. Determination of equivalent weight of Acid, Base and Salt.

Modes of expression of the concentrations ( Molarity , Normality & Molality) with Simple Problems. pH of solution ( definition with simple numericals )  
Importance of pH in industry ( sugar, textile, paper industries only)

**Chapter 5 : Electrochemistry** : Definition and types ( Strong & weak) of Electrolytes with example. Electrolysis ( Principle & process) with example of NaCl (fused and aqueous solution).

Faraday's 1<sup>st</sup> and 2<sup>nd</sup> law of Electrolysis ( Statement, mathematical expression and Simple numerical) Industrial application of Electrolysis- Electroplating ( Zinc only).

**Chapter 6 : Corrosion:** Definition of Corrosion, Types of Corrosion- Atmospheric Corrosion, Waterline corrosion. Mechanism of rusting of Iron only. Protection from Corrosion by (i) Alloying and (ii) Galvanization.

## **B. INORGANIC CHEMISTRY**

**Chapter 7 : Metallurgy:** Definition of Mineral, ores , gangue with example. Distinction between Ores And Minerals. General methods of extraction of metals,

- i) Ore Dressing
- ii) Concentration ( Gravity separation, magnetic separation, Froth floatation & leaching)
- iii) Oxidation (Calcinations, Roasting )
- iv) Reduction (Smelting, Definition & examples of flux, slag)
- v) Refining of the metal ( Electro refining, & Distillation only)

**Chapter 8 : Alloys:** Definition of alloy. Types of alloys ( Ferro, Non Ferro & Amalgam) with example. Composition and uses of Brass, Bronze, Alnico, Duralumin

## **C. ORGANIC CHEMISTRY**

**Chapter 9 : Hydrocarbons :** Saturated and Unsaturated Hydrocarbons ( Definition with example)

Aliphatic and Aromatic Hydrocarbons ( Huckle's rule only). Difference between Aliphatic and aromatic hydrocarbons

IUPAC system of nomenclature of Alkane, Alkene, Alkyne, alkyl halide and alcohol ( up to 6 carbons ) with bond line notation.

Uses of some common aromatic compounds ( Benzene, Toluene, BHC, Phenol, Naphthalene, Anthracene and Benzoic acid) in daily life.

## **D. INDUSTRIAL CHEMISTRY**

**Chapter 10 : Water Treatment :** Sources of water, Soft water, Hard water, hardness, types of Hardness (temporary or carbonate and permanent or non-carbonate), Removal of hardness by lime soda method ( hot lime & cold lime—Principle, process & advantages ) , Advantages of Hot lime over cold lime process.

Organic Ion exchange method ( principle, process, and regeneration of exhausted resins)

**Chapter 11 : Lubricants:** Definition of lubricant, Types ( solid, liquid and semisolid with examples only ) and specific uses of lubricants ( Graphite, Oils, Grease), Purpose of lubrication

**Chapter 12 : Fuel:** Definition and classification of fuel, Definition of calorific value of fuel, Choice of good fuel.

Liquid: Diesel, Petrol, and Kerosene --- Composition and uses.

Gaseous: Producer gas and Water gas (Composition and uses). Elementary idea about LPG, CNG and coal gas (Composition and uses only).

**Chapter 13 : Polymer:** Definition of Monomer, Polymer, Homo-polymer, Co-polymer and Degree of polymerization. Difference between Thermosetting and Thermoplastic, Composition and uses of Polythene, & Poly-Vinyl Chloride and Bakelite.

Definition of Elastomer ( Rubber). Natural Rubber (it's draw backs ). Vulcanisation of Rubber. Advantages of Vulcanised rubber over raw rubber.

**Chapter 14: Chemicals in Agriculture:** Pesticides: Insecticides, herbicides, fungicides- Examples and uses.

Bio Fertilizers: Definition, examples and uses.

## **Syllabus Coverage upto I.A**

Chapter 1,2,3,4,5,6

**Books Recommended**

1. Text Book of Intermediate Chemistry Part-1 and Part-2 by Nanda, Das, Sharma, Kalyani Publishers
2. Engg. Chemistry by B.K. Sharma, Krishna Prakashan Media Pvt. Ltd
3. Engineering Chemistry by Y.R. Sharma and P. Mitra, Kalyani Publishers
4. Engineering Chemistry for Diploma – Dr. R K Mohapatra, PHI Publication, New Delhi.
5. Engineering Chemistry- Jain & Jain, Dhanpat Roy and Sons.

## Th.3. ENGINEERING MATHEMATICS-I ( 1<sup>ST</sup> Sem Common)

Theory: 5 Periods per Week  
Total Periods: 75 Periods  
Examination: 3 Hours

I.A : 20 Marks  
End Sem Exam : 80 Marks  
TOTAL MARKS : 100 Marks

### OBJECTIVE:

1. This subject helps the students to develop logical thinking which is useful in comprehending the principles of all to the subjects.
2. Analytical and systematic approach towards any problem is developed through learning of this subject.
3. Mathematics being a versatile subject can be used at every stage of human life.

### Topic wise distribution of periods and marks

Sl. No.	Subject	Unit	Topic	Periods
A	Algebra	1	Matrices and Determinant	18
B	Trigonometry	2	Trigonometry	15
C	Two Dimensional Geometry	3	Co-ordinate Geometry in Two Dimensions (Straight Line)	13
		4	Circle	07
D	Three Dimensional Geometry	5	Co-ordinate Geometry in Three Dimensions	15
		6	Sphere	07
			<b>TOTAL</b>	<b>75</b>

### 1) MATRICES AND DETERMINANTS

- a) Types of matrices
- b) Algebra of matrices
- c) Determinant
- d) Properties of determinant
- e) Inverse of a matrix (second and third order)  
(Question should be on second order matrix)
- f) Cramer's Rule (Question should be on two variables)
- g) Solution of simultaneous equations by matrix inverse method  
(Question should be on two variables)

### 2) TRIGONOMETRY

- a) Trigonometrical ratios
- b) Compound angles, multiple and sub-multiple angles (only formulae)
- c) Define inverse circular functions and its properties (no derivation)

### 3) CO-ORDINATE GEOMETRY IN TWO DIMENSIONS (Straight line)

- a) Introduction of geometry in two dimension
- b) Distance formulae, division formulae, area of a triangle (only formulae no derivation)
- c) Define slope of a line, angle between two lines (only F), condition of perpendicularity and parallelism.
- d) Different forms of straight lines (only formulae)
  - i) One point form (ii) two point form (iii) slope form (iv) intercept form
  - (v) Perpendicular form
- e) Equation of a line passing through a point and (i) parallel to a line  
(ii) Perpendicular to a line
- f) Equation of a line passing through the intersection of two lines
- g) Distance of a point from a line

### 4) CIRCLE



- a) Equation of a circle
  - (i) center radius form
  - (ii) general equation of a circle
  - (iii) end point of diameter form

#### **5) CO-ORDINATE GEOMETRY IN THREE DIMENSIONS**

- a) Distance formulae, section formulae, direction ratio, direction cosine, angle between two lines (condition of parallelism and perpendicularity)
- b) Equation of a plane
  - i) General form, angle between two planes, perpendicular distance of a point from a plane, equation of a plane passing through a point and
  - i) parallel to a plane (ii) perpendicular to a plane

#### **6) SPHERE**

- a) Equation of a sphere
  - i) center radius form
  - ii) general form
  - iii) two end points of a diameter form (only formulae and problems)

#### **Books Recommended:**

1. Elements of Mathematics \_ Vol. \_ 1 & 2 (Odisha State Bureau of Text Book preparation & Production)

#### **Reference Books:**

1. Mathematics Part- I & Part- II- Textbook for Class XII, NCERT Publication

#### **Syllabus to be covered up to IA**

**Ch.1, Ch,2, and Ch,3,(a,b,c)**

## Th. 4. ENGINEERING MECHANICS ( 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week  
Total Periods: 60 Periods  
Examination: 3 Hours

I.A : 20 Marks  
End Sem Exam : 80 Marks  
TOTAL MARKS : 100 Marks

### Objective:

**On completion of the subject, the student will be able to do:**

1. Compute the force, moment & their application through solving of simple problems on coplanar forces.
2. Understand the concept of equilibrium of rigid bodies.
3. Know the existence of friction & its applications through solution of problems on above.
4. Locate the C.G. & find M.I. of different geometrical figures.
5. Know the application of simple lifting machines.
6. Understand the principles of dynamics.

### Topic wise distribution of periods

Sl. No.	Topics	Periods
1	Fundamentals of Engineering Mechanics	14
2	Equilibrium	08
3	Friction	10
4	Centroid & moment of Inertia	14
5	Simple Machines	08
6	Dynamics	06
	<b>TOTAL</b>	<b>60</b>

### 1. FUNDAMENTALS OF ENGINEERING MECHANICS

#### 1.1 Fundamentals.

Definitions of Mechanics, Statics, Dynamics, Rigid Bodies,

#### 1.2 Force

Force System.

Definition, Classification of force system according to plane & line of action.

Characteristics of Force & effect of Force. Principles of Transmissibility & Principles of Superposition. Action & Reaction Forces & concept of Free Body Diagram.

#### 1.3 Resolution of a Force.

Definition, Method of Resolution, Types of Component forces, Perpendicular components & non-perpendicular components.

#### 1.4 Composition of Forces.

Definition, Resultant Force, Method of composition of forces, such as

1.4.1 Analytical Method such as Law of Parallelogram of forces & method of resolution.

#### 1.4.2. Graphical Method.

Introduction, Space diagram, Vector diagram, Polygon law of forces.

1.4.3 Resultant of concurrent, non-concurrent & parallel force system by Analytical & Graphical Method.

#### 1.5 Moment of Force.

Definition, Geometrical meaning of moment of a force, measurement of moment of a force & its S.I units. Classification of moments according to

direction of rotation, sign convention, Law of moments, Varignon's Theorem, Couple – Definition, S.I. units, measurement of couple, properties of couple.

## **2. EQUILIBRIUM**

2.1 Definition, condition of equilibrium, Analytical & Graphical conditions of equilibrium for concurrent, non-concurrent & Free Body Diagram.

2.2 Lamia's Theorem – Statement, Application for solving various engineering problems.

## **3. FRICTION**

3.1 Definition of friction, Frictional forces, Limiting frictional force, Coefficient of Friction.

Angle of Friction & Repose, Laws of Friction, Advantages & Disadvantages of Friction.

3.2 Equilibrium of bodies on level plane – Force applied on horizontal & inclined plane (up & down).

3.3 Ladder, Wedge Friction.

## **4. CENTROID & MOMENT OF INERTIA**

4.1 Centroid – Definition, Moment of an area about an axis, centroid of geometrical figures such as squares, rectangles, triangles, circles, semicircles & quarter circles, centroid of composite figures.

4.2 Moment of Inertia – Definition, Parallel axis & Perpendicular axis Theorems. M.I. of plane lamina & different engineering sections.

## **5. SIMPLE MACHINES**

5.1 Definition of simple machine, velocity ratio of simple and compound gear train, explain simple & compound lifting machine, define M.A, V.R. & Efficiency & State the relation between them, State Law of Machine, Reversibility of Machine, Self Locking Machine.

5.2 Study of simple machines – simple axle & wheel, single purchase crab winch & double purchase crab winch, Worm & Worm Wheel, Screw Jack.

5.3 Types of hoisting machine like derricks etc, Their use and working principle. No problems.

## **6. DYNAMICS**

6.1 Kinematics & Kinetics, Principles of Dynamics, Newton's Laws of Motion, Motion of Particle acted upon by a constant force, Equations of motion, D'Alembert's Principle.

6.2 Work, Power, Energy & its Engineering Applications, Kinetic & Potential energy & its application.

6.3 Momentum & impulse, conservation of energy & linear momentum, collision of elastic bodies, and Coefficient of Restitution.

### **Syllabus coverage upto I.A**

Chapter 1, 2 and 3.1

### **Books Recommended**

1. Engineering Mechanics – by A.R. Basu (TMH Publication Delhi)
2. Engineering Machines – Basudev Bhattacharya (Oxford University Press).
3. Text Book of Engineering Mechanics – R.S Khurmi (S. Chand).
4. Applied Mechanics & Strength of Material – By I.B. Prasad.
5. Engineering Mechanics – By Timosheenko, Young & Rao.
6. Engineering Mechanics – Beer & Johnson (TMH Publication).

## Th.4(a). BASIC ELECTRICAL ENGINEERING

(1<sup>st</sup> sem Common)

Theory: 2 Periods per Week  
Total Periods: 30 Periods  
Examination: 1.5 Hours

I.A : 10 Marks  
End Sem Exam : 40 Marks  
TOTAL MARKS : 50 Marks

### Topic wise Distribution of Periods and Marks

Sl.No.	Topics	Periods
1	Fundamentals	05
2	A C Theory	08
3	Generation of Elect. Power	03
4	Conversion of Electrical Energy	07
5	Wiring and Power Billing	04
6	Measuring Instrument	03
	<b>Total</b>	<b>30</b>

#### Objective

1. To be familiar with A.C Fundamental and circuits
2. To be familiar with basic principle and application of energy conversion devices
3. To be familiar with generation of Electrical power
4. To be familiar with wiring and protective device
5. To be familiar with calculation and commercial Billing of electrical power & energy
6. To have basic knowledge of various electrical measuring instruments & conservation of electrical energy

#### 1. FUNDAMENTALS

- 1.1 Concept of current flow.
- 1.2 Concept of source and load.
- 1.3 State Ohm's law and concept of resistance.
- 1.4 Relation of V, I & R in series circuit.
- 1.5 Relation of V, I & R in parallel circuit.
- 1.6 Division of current in parallel circuit.
- 1.7 Effect of power in series & parallel circuit.
- 1.8 Kirchhoff's Law.
- 1.9 Simple problems on Kirchhoff's law.

#### 2. A.C. THEORY

- 2.1 Generation of alternating emf.
- 2.2 Difference between D.C. & A.C.
- 2.3 Define Amplitude, instantaneous value, cycle, Time period, frequency, phase angle, phase difference.
- 2.4 State & Explain RMS value, Average value, Amplitude factor & Form factor with Simple problems.
- 2.5 Represent AC values in phasor diagrams.
- 2.6 AC through pure resistance, inductance & capacitance
- 2.7 AC through RL, RC, RLC series circuits.
- 2.8 Simple problems on RL, RC & RLC series circuits.
- 2.9 Concept of Power and Power factor
- 2.10 Impedance triangle and power triangle.

### **3. GENERATION OF ELECTRICAL POWER**

- 3.1 Give elementary idea on generation of electricity from thermal , hydro & nuclear power station with block diagram

### **4. CONVERSION OF ELECTRICAL ENERGY**

(No operation, Derivation, numerical problems)

- 4.1 Introduction of DC machines.
- 4.2 Main parts of DC machines.
- 4.3 Classification of DC generator
- 4.4 Classification of DC motor.
- 4.5 Uses of different types of DC generators & motors.
- 4.6 Types and uses of single phase induction motors.
- 4.7 Concept of Lumen
- 4.8 Different types of Lamps (Filament, Fluorescent, LED bulb) its Construction and Principle.
- 4.9 Star rating of home appliances (Terminology, Energy efficiency, Star rating Concept)

### **5. WIRING AND POWER BILLING**

- 5.1 Types of wiring for domestic installations.
- 5.2 Layout of household electrical wiring (single line diagram showing all the important component in the system).
- 5.3 List out the basic protective devices used in house hold wiring.
- 5.4 Calculate energy consumed in a small electrical installation

### **6. MEASURING INSTRUMENTS**

- 6.1 Introduction to measuring instruments.
- 6.2 Torques in instruments.
- 6.3 Different uses of PMMC type of instruments (Ammeter & Voltmeter).
- 6.4 Different uses of MI type of instruments (Ammeter & Voltmeter).
- 6.5 Draw the connection diagram of A.C/ D.C Ammeter, voltmeter, energy meter and wattmeter. (Single phase only).

### **Syllabus Coverage upto I.A**

Chapter 1,2,3

### **BOOKS RECOMENDED:**

- 1. ABC of Electrical Enginnering by Jain & Jain (Dhanpat Rai Publication)
- 2. Fundamentals of Electrical Engg and Electronics by B.L Thereja
- 3. Concept of Basic Electrical Enginnering ,P.K Das and A.K. Mallick by B.M Publications
- 4. Fundamentals of Electrical Engg by Asfaq Hussain
- 5. Fundamentals of Electrical Engg by JB Gupta
- 6. Basic Electrical Engg. By Chakraborti (Mcgraw Hill)

## **Th.4(b). BASIC ELECTRONIC ENGINEERING**

**(1<sup>st</sup> sem Common)**

Theory: 2 Periods per Week  
Total Periods: 30 Periods  
Examination: 1.5 Hours

I.A : 10 Marks  
End Sem Exam : 40 Marks  
TOTAL MARKS : 50 Marks

### **Topic wise Distribution of Periods and Marks**

Sl.No.	Topics	Periods
1	Electronic Devices	8
2	Electronic circuits	9
3	Communication System	3
4	Transducers & Measuring instruments	10
	<b>Total</b>	<b>30</b>

#### **Objective**

1. To be familiar with Electronic devices
2. To be familiar with Electronic circuits
3. To be familiar with communication system
4. To be familiar with Electronic measuring instruments

#### **1. ELECTRONIC DEVICES**

- 1.1 Basic Concept of Electronics and its application.
- 1.2 Basic Concept of Electron Emission & its types.
- 1.3 Classification of material according to electrical conductivity (Conductor, Semiconductor & Insulator) with respect to energy band diagram only.
- 1.4 Difference between Intrinsic & Extrinsic Semiconductor.
- 1.5 Difference between vacuum tube & semiconductor.
- 1.6 Principle of working and use of PN junction diode, Zener diode and Light Emitting Diode (LED)
- 1.7 Integrated circuits (I.C) & its advantages.

#### **2. ELECTRONIC CIRCUITS**

- 2.1 Rectifier & its uses.
- 2.2 Principles of working of different types of Rectifiers with their merits and demerits
- 2.3 Functions of filters and classification of simple Filter circuit (Capacitor, choke input and  $\pi$ )
- 2.4 Working of D.C power supply system (unregulated) with help of block diagrams only
- 2.5 Transistor, Different types of Transistor Configuration and state output and input current gain relationship in CE, CB and CC configuration( No mathematical derivation)
- 2.6 Need of biasing and explain different types of biasing with circuit diagram.( only CE configuration)
- 2.7 Amplifiers(concept) , working principles of single phase CE amplifier
- 2.8 Electronic Oscillator and its classification
- 2.9 Working of Basic Oscillator with different elements through simple Block Diagram

#### **3. COMMUNICATION SYSTEM**

- 3.1 Basic communication system (concept & explanation with help of Block diagram)
- 3.2 Concept of Modulation and Demodulation, Difference between them
- 3.3 Different types of Modulation (AM, FM & PM) based on signal, carrier wave and modulated wave (only concept, No mathematical Derivation)

#### **4. TRANSDUCERS AND MEASURING INSTRUMENTS**

- 4.1 Concept of Transducer and sensor with their differences.
- 4.2 Different type of Transducers & concept of active and passive transducer.
- 4.3 Working principle of photo emissive, photoconductive, photovoltaic transducer and its application
- 4.4 Multimeter and its applications
- 4.5 Analog and Digital Multimeter and their differences
- 4.6 Working principle of Multimeter with Basic Block diagram
- 4.7 CRO, working principle of CRO with simple Block diagram

#### **Syllabus Coverage upto I.A**

Chapter 1,2(upto 2.6)

#### **BOOKS RECOMENDED:**

- 1. Principles of Electronics by V.K Mehta and Rohit Mehta,S Chand Publication
- 2. Principles of Electronics by S.K. SAHADEV (Dhanpatrai Publication)

### Th.3. ENGINEERING MATHEMATICS – II ( 2<sup>nd</sup> Sem Common)

Theory: 5 Periods per Week  
Total Periods: 75 Periods  
Examination: 3 Hours

I.A : 20 Marks  
End Sem Exam : 80 Marks  
TOTAL MARKS : 100 Marks

#### Objective:

Principles and application in Engineering are firmly ground on abstract mathematical structures. Students passing from secondary level need familiarization with such structure with a view to develop their knowledge, skill and perceptions about the applied science. Calculus is the most important mathematical tool in forming engineering application into mathematical models. Wide application of calculus makes it imperative to develop methods of solving differential equations. The knowledge of limit, derivative and derivative needs to be exhaustively practiced. To help a systematic growth of skill in solving equation by calculus method will be the endeavor of this course content. Understanding the concept of co-ordinate system in 3D in case of lines, planes and sphere and it's use to solve Engineering problems. After completion of the course the student will be equipped with basic knowledge to form equations and solve them competently.

#### Topic wise distribution of periods

Sl. No.	Topics	Periods	Marks
1	Vector Algebra	15	12
2	Limits and Continuity	12	12
3	Derivatives	21	20
4	Integration	15	24
5	Differential Equation	12	12
TOTAL		75	80

#### 1) VECTOR ALGEBRA

- Introduction
- Types of vectors (null vector, parallel vector , collinear vectors)  
(in component form )
- Representation of vector
- Magnitude and direction of vectors
- Addition and subtraction of vectors
- Position vector
- Scalar product of two vectors
- Geometrical meaning of dot product
- Angle between two vectors
- Scalar and vector projection of two vectors
- Vector product and geometrical meaning  
(Area of triangle and parallelogram)

#### 2) LIMITS AND CONTINUITY

- Definition of function, based on set theory
- Types of functions
  - Constant function
  - Identity function
  - Absolute value function
  - The Greatest integer function
  - Trigonometric function
  - Exponential function
  - Logarithmic function
- Introduction of limit
- Existence of limit
- Methods of evaluation of limit



$$\text{i) } \lim_{x \rightarrow 0} \frac{x^n - a^n}{x - a} = na^{n-1}$$

$$\text{ii) } \lim_{x \rightarrow 0} \frac{a^x - 1}{x} = \log_e a$$

$$\text{iii) } \lim_{x \rightarrow 0} \frac{e^x - 1}{x} = 1$$

$$\text{iv) } \lim_{x \rightarrow 0} (1 + x)^{1/x} = e$$

$$\text{v) } \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x = e$$

$$\text{vi) } \lim_{x \rightarrow 0} \frac{\log(1+x)}{x} = 1$$

$$\text{vii) } \lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

$$\text{viii) } \lim_{x \rightarrow 0} \frac{\tan x}{x} = 1$$

e) Definition of continuity of a function at a point and problems based on it

### 3) DERIVATIVES

a) Derivative of a function at a point

b) Algebra of derivative

c) Derivative of standard functions

$x^n, a^x, \log_a x, e^x, \sin x, \cos x, \tan x, \cot x, \sec x, \csc x, \sin^{-1} x, \cos^{-1} x, \tan^{-1} x, \cot^{-1} x, \sec^{-1} x, \csc^{-1} x$

d) Derivative of composite function (Chain Rule)

e) Methods of differentiation of

i) Parametric function

ii) Implicit function

iii) Logarithmic function

iv) a function with respect to another function

f) Applications of Derivative

i) Successive Differentiation (up to second order)

ii) Partial Differentiation (function of two variables up to second order)

g) Problems based on above

### 4) INTEGRATION

a) Definition of integration as inverse of differentiation

b) Integrals of standard functions

c) Methods of integration

i) Integration by substitution

ii) Integration by parts

d) Integration of the following forms

$$\text{i) } \int \frac{dx}{x^2 + a^2} \quad \text{ii) } \int \frac{dx}{x^2 - a^2} \quad \text{iii) } \int \frac{dx}{a^2 - x^2} \quad \text{iv) } \int \frac{dx}{\sqrt{x^2 + a^2}} \quad \text{v) } \int \frac{dx}{\sqrt{x^2 - a^2}} \quad \text{vi) } \int \frac{dx}{\sqrt{a^2 - x^2}} \\ \text{vii) } \int \frac{dx}{x\sqrt{x^2 - a^2}} \quad \text{viii) } \int \sqrt{a^2 - x^2} dx \quad \text{ix) } \int \sqrt{a^2 + x^2} dx \quad \text{x) } \int \sqrt{x^2 - a^2} dx$$

e) Definite integral, properties of definite integrals

$$\text{i) } \int_0^a f(x) dx = \int_0^a f(a - x) dx$$

$$\text{ii) } \int_a^b f(x) dx = - \int_b^a f(x) dx$$

$$\text{iii) } \int_a^c f(x) dx = \int_a^b f(x) dx + \int_b^c f(x) dx, \quad a < b < c$$

$$\text{iv) } \int_{-a}^a f(x) dx = 0, \text{ if } f(x) = \text{odd} \\ = 2 \int_0^a f(x) dx, \text{ if } f(x) = \text{even}$$

f) Application of integration

i) Area enclosed by a curve and X – axis

ii) Area of a circle with centre at origin

## 5) DIFFERENTIAL EQUATION

- a) Order and degree of a differential equation
- b) Solution of differential equation
  - i) 1st order and 1st degree equation by the method of separation of variables
  - ii) Linear equation  $\frac{dy}{dx} + Py = Q$ , where P,Q are functions of  $x$

### Syllabus to be covered up to IA

Ch. 2 and Ch. 3

#### **Books Recommended:**

1. Elements of Mathematics \_ Vol. \_ 1 & 2 (Odisha State Bureau of Text Book preparation & Production)

#### **Reference Books:**

Mathematics Part- I & Part- II- Textbook for Class XII, NCERT Publication

## **Pr.1a. Communicative English Lab**

**(1<sup>st</sup> & 2<sup>nd</sup> sem Common)**

Theory: 4 Periods per Week  
Total Periods: 60 Periods

Sessional : 50 Marks  
TOTAL MARKS : 50 Marks

SI No.	Topic	Periods
1	Listening Skill	10
2	Speaking Skill	20
3	Personality Development	10
4	Interpersonal Skills	10
5	Presenting in G D , Seminar and Conferences	10
	Total	60

### **PRACTICAL**

#### **1. LISTENING SKILLS**

- The student should be able to listen to a text read aloud in normal speed with focus on intonation
- After listening the student can fill-in-blanks, choose a suitable title, make a summary, supply required information and be able to answer comprehension questions from the passage read aloud.

#### **2. SPEAKING SKILL**

- Reading aloud of dialogues, texts, poems, speeches focusing on intonation.
- Self-introduction
- Role-plays on any two- situations
- Telephonic conversation

#### **3. PERSONALITY DEVELOPMENT**

- Initiation
- Physical appearance
- Audience purpose

#### **4. INTERPERSONAL SKILLS**

Appropriate use of non-verbal skills in face-to-face communication  
[I.e. viva- voice, group-interviews, GDs and seminars]

#### **5. PRESENTING IN GD, SEMINARS AND CONFERENCES**

- Leadership quality
- Time management
- Achieving the target

## **Pr.1b. COMPUTER APPLICATION Lab**

**(1<sup>st</sup> / 2<sup>nd</sup> sem Common)**

Theory: 4 Periods per Week  
Total Periods: 60 Periods

Sessional : 50 Marks  
TOTAL MARKS : 50 Marks

- 1. BASICCOMPUTER OPERATION** **2 periods**  
Identification of different components of Computer  
Switch on and Booting Process  
Shut down, Restart of computer
- 2. OPERATINGSYSTEM** **13 periods**  
Basic DOS commands (CLS, DIR, DATE, TIME, VERSION, MD, CD, RD, DEL, COPY, REN, USE OF WILD CARDS, PATH)  
Basic Windows OS operations (DESKTOP, ICONS,, START BUTTON, TASK BAR)  
MOUSE OPERATIONS- SINGLE CLICK, DOUBLE CLICK, DRAG  
MAXIMIZE, MINIMIZE, RESTORE Windows Explorer, My Computer Files and Folders, Copy, Cut, Paste  
Utilities: Word, notepad, paint, calculator etc
- 3. WORKING WITH MS-OFFICE** **20 periods**  
Basic operations of Word Processing Package. (MS-Word )  
Basic operations of Electronic Spread Sheet Package. (MS-Excel)  
Basic operations of Presentation Package (MS- Power point)  
*(Create, Edit, Format, Save, Print/View in the above three packages)*
- 4. WORKING WITH INTERNET** **10 periods**  
Getting acquainted with Internet connection, Browser, website  
URL, webpage, http, WWW, net browsing  
Creating E-Mail Id, sending and receiving E-mail Chatting
- 5. C PROGRAMMING** **15 periods**
  1. Write a Program in C to find the greatest number among three integers.
  2. Write a Program in C to find the average of n numbers by using for loop.
  3. Write a Program in C to compute  $(a + b)^3$
  4. Write a Program in C to convert time in seconds to time in hours, minutes and seconds.
  5. Write a program in C to find the sum of the following series.  $1+1/x+1/x^2+.....+1/x^n$
  6. Write a program in C to determine whether a number is prime or not?
  7. Write a program in C to compute simple interest and compound interest of a given principal, rate of interest and time period.
  8. Write a program in C to check whether a given number is palindrome or not?
  9. Write a program in C to compute the sine series.
  10. Write a program in C to accept row wise and column wise element in a two dimensional array and print them.
  11. Write a program in C to find the number of times an element occurs in an array.
  12. Write a program in C to find the vowels in a given string.
  13. Write a program in C to find the factorial of a number, by using recursion.
  14. Write a program in C to find the sum of Fibonacci series, by using function.
  15. Write a program in C to accept a number from keyboard and print it in reverse order of entry, by using function.

## **Pr.2a. Engineering Physics Lab**

**(1<sup>st</sup> / 2<sup>nd</sup> sem Common)**

Theory: 4 Periods per Week  
Total Periods: 60 Periods  
Examination: 3 Hours

Sessional : 50 Marks  
End Sem Exams : 50 Marks  
TOTAL MARKS : 100 Marks

**(Any 10 Experiments)**

<b>SL.NO</b>	<b>NAME OF THE EXPERIMENTS</b>
1	To find the cross sectional area of a wire using a screw gauge.
2	To find the thickness and volume of a glass piece using a screw gauge.
3	To find volume of a solid cylinder using a Vernier Calipers.
4	To find volume of a hollow cylinder using a Vernier Calipers.
5	To determine the radius of curvature of convex surface using a Spherometer.
6	To determine the radius of curvature of concave surface using a Spherometer.
7	To find the time period of a simple pendulum and determine acceleration due to gravity.
8	To determine the angle of Prism.
9	To determine the angle of Minimum Deviation by I ~ D curve method.
10	To trace lines of force due to a bar magnet with North pole pointing North and locate the neutral points.
11	To trace lines of force due to a bar magnet with North pole pointing South and locate the neutral points.
12	To verify Ohm's Law by Ammeter – Voltmeter method.

## Pr.2b. Engineering Chemistry Lab

(1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 4 Periods per Week

Total Periods: 60 Periods

Examination: 3 Hours

Sessional : 50 Marks

End Sem Exams : 50 Marks

TOTAL MARKS :100 Marks

Sl No.	Experiment
1	Preparation and study of physical and chemical properties CO <sub>2</sub> gas.
2	Preparation and study of physical and chemical properties NH <sub>3</sub> gas.
3	Crystallization of Copper sulphate from copper carbonate.
4	Simple acid-base titrations (i) Acidimetry (ii) Alkalimetry
5	Tests for acid radicals (Known): (i) Carbonate, (ii) Sulphide, (iii) Chloride, (iv) Nitrate and (v) Sulphate.
6	Test for Basic radicals (Known): (i) Ammonium, (ii) Zinc, (iii) Magnesium, (iv) Aluminium, (v) Calcium, (vi) Sodium and (vii) potassium.
7	Test for unknown Acid radicals
8	Test for unknown basic radicals
9	Test for unknown salt (composed of one basic radical and one acid radical)

### Recommended Books:

- (i) Practical Intermediate Chemistry By Dr. Bichitrananda Nanda
- (ii) Elemental Experimental chemistry by Dr. Y R Sharma, A K Das, Kalyani Publisher

## Pr.3a. Engineering Drawing

(1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 6 Periods per Week

Total Periods: 90 Periods

Examination: 3 Hours

Sessional : 50 Marks

End Sem Exams : 100 Marks

TOTAL MARKS : 150 Marks

### Objective

After completion of the study of Engg. Drawing the student should be able to

1. Understand the importance of Engineering Drawing.
2. Demonstrate the use of different drawing instrument.
3. Make free hand lettering and numbering.
4. Practice of dimensioning of drawing.
5. Undertake different geometric constructions, projections of straight line, planes and solids.
6. Take up different orthographic projections.
7. Draw sectional views, development of surface of different solids.
8. Develop the concept of building drawing.
9. Prepare 2D engineering drawing using Auto CAD software.

### Topic wise distribution of periods.

Sl. No.	Topics	Periods
1	Introduction and Demonstration	03
2	Types of Lines, Lettering & Dimensioning	03
3	Scales	03
4	Curves	06
5	Orthographic Projections	21
6	Section and Developments	21
7	Isometric Projections	06
8	Building Drawing	12
9	Practices on Auto CAD	15
	<b>TOTAL</b>	<b>90</b>

(All drawings are to be made in First Angle Projection)

### 1. INTRODUCTION & DEMONSTRATION

- 1.1 Identify various sizes of drawing boards, drawing sheets as per BIS.
- 1.2 List the types of pencils, instruments, and scales (RF).
- 1.3 Demonstrate laying of drawing sheet, margin, standard layout and title block as per BIS, folding principle of drawings (blue prints, print outs etc).

### 2. TYPES OF LINES, LETTERING & DIMENSIONING

- 2.1 Demonstrate and explain the use of various types of lines.
- 2.2 Demonstrate the principle of single stroke, gothic lettering & numerals as per BIS.

### 3. SCALES

- 3.1 Significance of scales in drawing; different scales.
- 3.2 Define and draw plain scale and diagonal scale.

#### **4. CURVES**

- 4.1 Explain Conic sections with illustration, Explain terms like focus, vertex, directrix and eccentricity.
- 4.2 Draw conics sections by eccentricity method – Ellipse, Parabola and Hyperbola.
- 4.3 Draw Ellipse by concentric circle method and arc of circle method.
- 4.4 Draw parabola by Rectangle Method and Tangent Method.

#### **5. ORTHOGRAPHIC PROJECTIONS**

- 5.1 Demonstrate the principles of 1<sup>st</sup> angle and 3<sup>rd</sup> angle projections with the help of models and draw symbols.
- 5.2 Draw projection of points.
- 5.3 Draw projection of straight line (parallel to both planes, parallel to one and perpendicular to other, parallel to one and inclined to other and inclined to both reference planes).
- 5.4 Draw plane figure such as squares, rectangles, triangles, circle, Pentagon and hexagon (perpendicular to one plane and inclined to other).
- 5.5 Draw projections of solids such as prism, cylinder, cone, tetrahedron and pyramid in simple position (with axis parallel to one reference plane and perpendicular to other reference plane).

#### **6. SECTION & DEVELOPMENTS**

- 6.1 Draw the sectional projection & development of prism, cylinder, cone and pyramid in simple position by a cutting plane perpendicular to one reference plane and inclined to other reference plane.
- 6.2 Draw true shape of the cutting sections.

#### **7. ISOMETRIC PROJECTIONS**

Draw isometric view & Isometric projection of prism, pyramid, cone & cylinder with axis horizontal and vertical with construction of isometric scales.

#### **8. BUILDING DRAWING**

- 8.1 Explain terms related to building drawing.
- 8.2 Draw plan, elevation of single room building with verandah (Flat roof according to given line plan and specification).

#### **9. PRACTICES ON AUTO CAD**

- 9.1 Introduction-Settings, Limits etc.
- 9.2 Auto CAD commands-  
Draw commands (Line, circle, arc, polygon, ellipse, rectangle).  
Edit command, Dimension commands and Modify Commands for two dimensional drafting only.
- 9.3 Exercise for practice using Auto CAD.
  - 9.3.1 Orthographic projections of lines, planes and solids as per chapter 5.0.
  - 9.3.2 Isometric projection as per Chapter 7.0.

**Note:** Focus should be on Hands on Practice of student using AutoCAD software

#### **Books Recommended**

- 1. Machine Drawing by Basudeb Bhattacharya, Oxford University Press.
- 2. A Text Book of Engineering Drawing by Dr. R.K. Dhawan.
- 3. A Text Book of Engineering Graphics & Auto CAD by K Venugopal.
- 4. A Text book of Engineering Drawing by N.D. Bhatt.
- 5. Engineering Drawing by P.S. Gill.
- 6. A Introduction to Auto CAD – 2012 by George Omura, Wiley India Publishers.



## Pr.3b. Workshop Practice

(1<sup>st</sup> / 2<sup>nd</sup> sem Common)

Theory: 6 Periods per Week  
Total Periods: 90 Periods  
Examination: 4 Hours

Sessional : 50 Marks  
End Sem Exams : 100 Marks  
TOTAL MARKS : 150 Marks

### Objective:

1. To demonstrate safely practice in various shops of the workshop.
2. To select suitable tools & equipment in the following shops. (a) Fitting.  
(b) Sheet Metal.  
(c) Welding (Gas & Electrical). (d) Turning.
3. To select suitable materials for different process in the above shops.
4. To demonstrate the different processes adopted in the above shops.
5. To finish the jobs within stipulated time and with accuracy as per specifications.

### Topic Wise distribution of periods

Sl. No.	Topics	Periods
1	Fitting Shop	24
2	Sheet Metal	18
3	Welding Shop	24
4	Turning Shop	21
5	Exposure to CNC Milling / Lathe Machine	03
	<b>TOTAL</b>	<b>90</b>

### 1. FITTING SHOP

- 1.1 Demonstrate safety practices in the fitting shop.
- 1.2 Select suitable holding & clamping devices for fitting jobs.
- 1.3 Select suitable tools like- files, vice, chisels, punch, scriber, hammers, surface plate, V-block, try square, caliper etc.
- 1.4 Demonstrate the following operations:  
Sawing, Chipping, Fitting, Craping, Grinding, Marking, Reaming, Tapping, Drilling & Angular cutting.
- 1.5 Introduction of chipping, demonstration on chipping and its applications.
- 1.6 Description, demonstration and practice of simple operation of hack saw straight and angular cutting.
- 1.7 Introduction and use of measuring tools used in fitting shop like steel rule, measuring tape, outside micrometer, vernier caliper and vernier height gauge.
- 1.8 Description and Demonstration and practice of thread cutting using taps and dies.  
Job: Cutting & fitting practice on a square of 50mm X 50mm X 8mm  
MS Flat. Job: Angular cutting practice of 45 degree (on the above job).  
Job: Preparation of stud (to cut external threads) with the help of dies (mm or BSW). Job: H-fitting in the mild steel (ms) square.  
Job: Prepare one job on male female fitting.

## **2. SHEET METAL**

- 2.1 Demonstrate safety practices in sheet metal shop.
- 2.2 Prepare surface development for the jobs according to the drawing.
- 2.3 Cut M.S and G.P. sheets according to the surface development / drawing using standard sheet metal cutting tools.
- 2.4 Select hand tools for sheet metal work.
- 2.5 Demonstrate the process of metal clamp joining and reveted joining of sheet metals.

Job: Making of sheet metal joints.

Job: Prepare a sheet metal tray or a funnel.

Job: Prepare a sheet metal job involving rolling, shearing, creasing, bending & cornering. Job: Prepare a lap riveting joint.

## **3. WELDING SHOP**

- 3.1 Introduction.
- 3.2 Safety precautions in welding, safety equipments & its application in welding shop.
- 3.3 Introduction to welding, type of welding, common materials that can be welded, introduction to gas welding equipment, types of flame, adjustment of flame, applications of gas welding, Welding tools & safety precautions.
- 3.4 Introduction to electric arc welding (AC & DC), practice in setting current & voltage for striking proper arc, precautions while using electric arc welding. Applications of arc welding. Introduction to polarity & their use.
- 3.5 Demonstrate & use of the different tools used in the welding shop with sketches, Hand shield, helmet, clipping hammer, gloves, welding lead, connectors, aprons, goggles, etc.
- 3.6 Demonstrate of welding defects & various types of joints & end preparation.  
Job: Preparation of lap joint by arc welding rod. Job: Preparation of Tee joint by arc welding.  
Job: Preparation of single V or double V butt joint by electric arc welding. Job: Brazing practice. Use of Spelt or (on MS sheet pieces).  
Job: Gas welding practice on worn-out & broken parts.

## **4. TURNING SHOP**

- 4.1 Introduction.
- 4.2 Safety precaution & safety equipments.
- 4.3 Various marking, measuring, cutting & holding tools.
- 4.4 Demonstration of different parts of a lathe, demonstration on centering & turning operation in a group of 06 students.  
Job: plain turning, taper turning & grooving practices on round bar.

## **5. EXPOSURE TO C.N.C MILLING / LATHE MACHINE**

### **Reference Books**

1. Workshop Technology by S.K.Hajara Choudhary, Media Promoters Publishers, New Delhi.
2. Workshop Technology by B.S. Raghubanshi, Dhanpat Rai and Sons, New Delhi.
3. Workshop Technology by H.S. Bawa – TMH.
4. Workshop Familiarization by E Wilkinson.
5. Sheet metal shop practice by Bruce & Meyer.
6. Workshop Technology by R.S. Khurmi & J.K. Gupta, S.Chand.

### **Notes**

1. *Work, Progress book should be maintained continuously.*
2. *The roll numbers of the students must be punched on each job.*
3. *The turning shop job should be done by students' maximum 06 students in a group*

## **Pr.4 Seminar**

**(1<sup>st</sup> / 2<sup>nd</sup> sem Common)**

Theory: 4 Periods per Week  
Total Periods: 60 Periods

Sessional : 50 Marks  
TOTAL MARKS : 50 Marks

The students shall present seminar on different topics on latest science and Technology in the entire class. There shall not be any grouping of students. The students shall present the seminar topic to the whole class/section. All other students should be allowed and encouraged to put questions to the presenter student, who shall answer the questions. A student has to present seminar on at least 2 topics in a semester. He/she has to submit seminar report for each topic separately, to the teacher concerned, which shall be preserved for verification by the authorities. The students should be encouraged to refer to the magazines, journals ,e-materials etc. for preparing for seminar topic. Attendance of all students other than the presenters should be ensured, so that seminar shall be more participative and knowledge of students shall improve by listening to many topics presented.



## STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

**TEACHING AND EVALUATION SCHEME FOR 3rd Semester Civil Engineering (wef 2019-20)**

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		<b>Theory</b>							
Th.1		Structural Mechanics	5		-	20	80	3	100
Th.2		Geotechnical Engineering	4		-	20	80	3	100
Th.3		Building materials & Construction Technology	5		-	20	80	3	100
Th.4		Estimation & Cost Evaluation- I	4			20	80	3	100
Th.5		Environmental studies	4			20	80	3	100
		<i>Total</i>	22			100	400	-	500
		<b>Practical</b>							
Pr.1		Civil Engg. Lab-I	-	-	6	50	100		
Pr.2		Civil Engg. Drawing-I	-	-	5	25	50		
Pr.3		Estimation Practice-I (Computer-Aided)	-	-	3	25			
		Student Centered Activities(SCA)		-	3	-	-	-	-
		<i>Total</i>	-	-	17	100	150	-	250
		<b>Grand Total</b>	<b>22</b>	<b>-</b>	<b>17</b>	<b>200</b>	<b>550</b>	<b>-</b>	<b>750</b>

Abbreviations: L-Lecturer, T-Tutorial, P-Practical. Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

**SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ Cultural activities/Library studies/Classes on MOOCS/SWAYAM etc., Seminar and SCA shall be conducted in a section.**

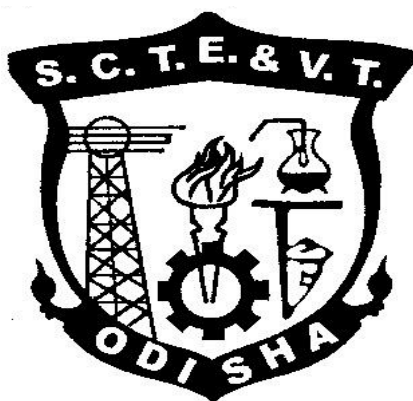
**There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester**

# **CURRICULLUM OF 3<sup>RD</sup> SEMESTER**

**For**

**DIPLOMA IN CIVIL ENGINEERING**

**(Effective From 2019-20 Session)**



**STATE COUNCIL FOR TECHNICAL EDUCATION &  
VOCATIONAL TRAINING, ODISHA,  
BHUBANESWAR**

# Th1. STRUCTURAL MECHANICS

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3 <sup>rd</sup>
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination:	80

## A. RATIONALE

The course aims to prepare the students to comprehend the design principles associated with the structural members. The students will develop competency in calculating necessary dimensions and material properties so that the members can withstand the loading conditions.

## B. COURSE OBJECTIVES

On completion of the course, students will be able to -

1. Comprehend, define, compute and interpret major mechanical properties demonstrated by solid materials.
2. Analyze solid states under uniaxial loading and plane stress conditions.
3. Draw shear force and bending moment diagrams of simple statically determinate and statically indeterminate structural members subject to transverse loading.
4. Obtain slope and deflection profiles of statically determinate simple structural members.
5. Comprehend buckling as a failure mode in column and determine crippling loads for columns using Euler's theory.
6. Compute forces in members of a truss

## C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Periods
1	Review of Basic Concepts	04
2	Simple and Complex Stress, Strain	15
3	Stresses in Beams	10
4	Columns and Struts	04
5	Shear Force and Bending Moment	12
6	Slope and Deflection	10
7	Indeterminate Beams	10
8	Trusses and Frames	10

## D. Course Contents:

### 1 Review Of Basic Concepts

- 1.1 Basic Principle of Mechanics: Force, Moment, support conditions, Conditions of equilibrium, C.G & MI, Free body diagram
- 1.2 Review of CG and MI of different sections

### 2 Simple And Complex Stress, Strain

## **2.1 Simple Stresses and Strains**

Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability, Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains, Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction, Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain, computation of stress, strain, Poisson's ratio, change in dimensions and volume etc, Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants.

## **2.2 Application of simple stress and strain in engineering field:**

Behaviour of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material, Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Percentage elongation, Percentage reduction in area, Significance of percentage elongation and reduction in area of cross section, Deformation of prismatic bars due to uniaxial load, Deformation of prismatic bars due to its self weight.

## **2.3 Complex stress and strain**

Principal stresses and strains: Occurrence of normal and tangential stresses, Concept of Principal stress and Principal Planes, major and minor principal stresses and their orientations, Mohr's Circle and its application to solve problems of complex stresses

# **3**

## **Stresses In Beams and Shafts**

**3.1 Stresses in beams due to bending:** Bending stress in beams – Theory of simple bending – Assumptions – Moment of resistance – Equation for Flexure– Flexural stress distribution – Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus

**3.2 Shear stresses in beams:** Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.

**3.3 Stresses in shafts due to torsion:** Concept of torsion, basic assumptions of pure torsion, torsion of solid and hollow circular sections, polar moment of inertia, torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion



**3.4 Combined bending and direct stresses:** Combination of stresses, Combined direct and bending stresses, Maximum and Minimum stresses in Sections, Conditions for no tension, Limit of eccentricity, Middle third/fourth rule, Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls

## **4 Columns and Struts**

**4.1** Columns and Struts, Definition, Short and Long columns, End conditions, Equivalent length / Effective length, Slenderness ratio, Axially loaded short and long column, Euler's theory of long columns, Critical load for Columns with different end conditions

## **5 Shear Force and Bending Moment**

### **5.1 Types of loads and beams:**

Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL), Types of Supports: Simple support, Roller support, Hinged support, Fixed support, Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction, Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium.

### **5.2 Shear force and bending moment in beams:**

Shear Force and Bending Moment: Signs Convention for S.F. and B.M, S.F and B.M of general cases of determinate beams with concentrated loads and udl only, S.F and B.M diagrams for Cantilevers, Simply supported beams and Over hanging beams, Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M.

## **6 Slope and Deflection**

**6.1 Introduction:** Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection.

**6.2** Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).

## **7 Indeterminate Beams**

**7.1** Indeterminacy in beams, Principle of consistent deformation/compatibility, Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition, SF and BM diagrams (point load and udl covering full span)

## **8 Trusses**

**8.1 Introduction:** Types of trusses, statically determinate and indeterminate trusses, degree of indeterminacy, stable and unstable trusses, advantages of trusses.

**8.2 Analysis of trusses:** Analytical method ( Method of joints, method of Section)

**E. Course Coverage Upto Internal Assessment:** Chapters 1,2,3,4

**F. Recommended Books**

<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	R.Subramanian	Strength of Materials	Oxford Publication
2	S.Rammrutham,	Theory of structure	Dhanpat Rai Publications
3	V.N.Vazirani&M.M. Rathwani	Analysis of Structures-Vol.I&II	Khanna Publication

## Th2. GEOTECHNICAL ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3 <sup>rd</sup>
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. Rationale

The course aims to prepare the students to comprehend the design principles associated with the civil foundations and other geotechnical structures. The students will develop competency in estimating and predicting soil strength and slope based on properties and design requirements.

### B. Course Objectives

On completion of the course, students will be able to -

1. comprehend the scope of soil mechanics and define the associated terminology and inter-relation among various soil properties.
2. classify and identify soil types under different standards
3. comprehend significance of permeability and seepage and compute those.
4. describe requirement and methodology of compaction and consolidation.
5. realize the methods towards shear strength estimation and obtain strength envelop for different types of soils.
6. define terms of foundation engineering and estimate bearing capacity.

### C. Topic Wise Distribution

Chapter	Name of topics	Hours
1	Introduction	02
2	Preliminary Definitions and Relationship.	06
3	Index Properties of soil	04
4	Classification of Soil	06
5	Permeability and Seepage	07
6	Compaction and Consolidation.	08
7	Shear Strength.	06
8	Earth Pressure on Retaining Structures.	07

9	Foundation Engineering.	14
---	-------------------------	----

#### **D. Course Contents:**

### **1 Introduction**

- 1.1 Soil and Soil Engineering
- 1.2 Scope of Soil Mechanics
- 1.3 Origin and formation of soil

### **2 Preliminary Definitions and Relationship**

- 2.1 Soil as a three Phase system.
- 2.2 Water Content, Density, Specific gravity, Voids ratio, Porosity, Percentage of air voids, air content, degree of saturation, density Index, Bulk/Saturated/dry/submerged density, Interrelationship of various soil parameters

### **3 Index Properties of Soil**

- 3.1 Water Content
- 3.2 Specific Gravity
- 3.3 Particle size distribution: Sieve analysis, wet mechanical analysis, particle size distribution curve and its uses
- 3.4 Consistency of Soils, Atterberg's Limits, Plasticity Index, Consistency Index, Liquidity Index

### **4 Classification of Soil**

- 4.1 General
- 4.2 I.S. Classification, Plasticity chart

### **5 Permeability and Seepage**

- 5.1 Concept of Permeability, Darcy's Law, Co-efficient of Permeability,
- 5.2 Factors affecting Permeability.
- 5.3 Constant head permeability and falling head permeability Test.
- 5.4 Seepage pressure, effective stress, phenomenon of quick sand

### **6 Compaction and Consolidation**

- 6.1 Compaction:** Compaction, Light and heavy compaction Test, Optimum Moisture

Content of Soil, Maximum dry density, Zero air void line, Factors affecting Compaction, Field compaction methods and their suitability

**6.2 Consolidation:** Consolidation, distinction between compaction and consolidation.

Terzaghi's model analogy of compression/ springs showing the process of consolidation – field implications

## **7 Shear Strength**

7.1 Concept of shear strength, Mohr- Coulomb failure theory, Cohesion, Angle of internal friction, strength envelope for different type of soil, Measurement of shear strength;- Direct shear test, triaxial shear test, unconfined compression test and vane-shear test

## **8 Earth Pressure on Retaining Structures**

8.1 Active earth pressure, Passive earth pressure, Earth pressure at rest.

8.2 Use of Rankine's formula for the following cases (cohesion-less soil only)

(i) Backfill with no surcharge, (ii) backfill with uniform surcharge

## **9 Foundation Engineering**

9.1 Functions of foundations, shallow and deep foundation, different type of shallow and deep foundations with sketches. Types of failure (General shear, Local shear & punching shear)

9.2 Bearing capacity of soil, bearing capacity of soils using Terzaghi's formulae & IS Code formulae for strip, Circular and square footings, Effect water table on bearing capacity of soil

9.3 Plate load test and standard penetration test

## **E. COURSE COVERAGE UPTO INTERNAL EXAMINATION**

Chapters 1, 2, 3, 4, 5, 6

## **F. RECOMMENDED BOOKS**

<b>Learning Resources</b>			
<b>Text Books</b>			
<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	Dr. B.C.Punmia	Soil Mechanics & Foundation Engineering	Laxmi publications (P) LTD
2	Dr. K.R.Arora	Soil Mechanics& Foundation Engineering	Standard Publishers Distributors Ltd.
3	Dr. V.N.S. Murthy	Soil Mechanics& Foundation Engineering, Vol-I	UBS Publishers Distributors Ltd.

## Th3.BUILDING MATERIALS AND CONSTRUCTIONS TECHNOLOGY

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3 <sup>rd</sup>
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

The course has two parts namely the materials and construction task. The first part offers insight to the common materials used in construction. This enables students to understand the application and processing requirement in the common construction materials. The second part of the course offers idea on construction activities based on components of a building. Another objective of the course is to develop concept of eco-friendly construction practices.

### B. COURSE OBJECTIVES

On completion of the course, students will be able to –

1. Realize the role of rock, bricks, cement, concrete, timber and steel in construction and comprehend the classification and processing tasks involved.
2. Understand the composition and mechanism of the protective paints and prescribe as necessary.
3. Classify buildings on occupancy and comprehend different components and their requirement in a building.
4. Understand the glossary of terms involved in foundation, masonry, wood works and other activities involved in building construction.
5. Grasp the construction details involved in a building.
6. Realize the significance of protecting environment and adopt necessary practices towards green construction.

### C. TOPIC WISE DISTRIBUTION

#### D.

Chapter	Name of topics	Hours
PART A: BUILDING MATERIALS		
1	Stone	05
2	Bricks	06
3	Cement, Mortar and Concrete	07

4	Other Construction Materials	07
5	Surface Protective Materials:	05
PART B: CONSTRUCTIONS TECHNOLOGY		
1	Introduction	02
2	Foundations	04
3	Walls & Masonry Works	06
4	Doors, Windows and Lintels:	04
5	Floors, Roofs and Stairs	05
7	Protective, Decorative Finishes and Termite Proofing	05
8	Green Buildings, Energy Management and Energy Audit of Buildings & Project:	04

## E. COURSE CONTENTS:

### ***PART :A (BUILDING MATERIALS)***

#### **1 Stone**

- 1.1 Classification of rock, uses of stone, natural bed of stone,
- 1.2 Qualities of good building stone,
- 1.3 Dressing of stone
- 1.4 Characteristics of different types of stone and their uses

#### **2 Bricks**

- 2.1 Brick earth – its composition
- 2.2 Brick making – Preparation of brick earth, Moulding, Drying, Burning in kilns (continuous Process)
- 2.3 Classification of bricks, size of traditional and modular bricks, qualities of good building bricks

#### **3 Cement, Mortar and Concrete**

- 3.1 Cement: Types of cements, Properties of cements, Manufacturing of cement
- 3.2 Importance and application of blended cement with fly ash and blast furnace slag.
- 3.3 Mortar: Definition and types of mortar
- 3.4 Sources and classification of sand, Bulking of sand
- 3.5 Use of gravel, morrum and fly ash as different building material
- 3.6 Concrete: Definition and composition- Water cement ratio- Workability, mechanical properties and grading of aggregates, mixing, placing, compacting and curing of concrete.

#### **4 Other Construction Materials**

- 4.1 Timber: Classification and Structure of timber.
- 4.2 Seasoning of timber – Importance.
- 4.3 Characteristics of good timber.
- 4.3 Clay products and refractory materials – Definition and Classification.
- 4.4 Properties and uses of refractory materials- tiles, terracotta, porcelain glazing.
- 4.5 Iron and Steel: Uses of cast iron, wrought iron, mild steel and tor steel

## **5 Surface Protective Materials**

- 5.1 Composition of Paints, enamels, varnishes.
- 5.2 Types and uses of surface protective materials like Paints, Enamels, Varnishes, Distempers, Emulsion, French polish and Wax Polish.

## ***PART: B (CONSTRUCTIONS TECHNOLOGY)***

## **1 Introduction**

- 1.1 Buildings and classification of buildings based on occupancy
- 1.2 Different components of a building.
- 1.3 Site investigation – objectives, site reconnaissance and explorations.

## **2 Foundations**

- 2.1 Concept of foundation and its purpose
- 2.2 Types of foundations – shallow and deep
- 2.3 Shallow foundation-constructural details of : Spread foundations for walls, thumb rules for depth and width of foundation and thickness of concrete block
- 2.4 Deep foundations: Pile foundations-their suitability, classification of piles based on materials, function and method of installation.

## **3 Walls & Masonry Works :**

- 3.1 Purpose of walls
- 3.2 Classification of walls – load bearing, non-load bearing walls, retaining walls.
- 3.3 Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls (Concept Only).



3.4 Partition Walls : Suitability and uses of brick and wooden partition walls

3.5 Brick masonry : Definition of different terms

3.6 Bond – meaning and necessity: English bond for 1 and 1-1/2 Brick thick walls. T, X and right angled corner junctions. Thickness for 1 and 1-1/2 brick square pillars in English bond

3.7 Stone Masonry :

3.8 Glossary of terms –String course, corbel, cornice, block-in-course, grouting, mouldings, templates, throating, through stones, parapet, coping, pilaster and buttress

## **4 Doors, Windows And Lintels**

4.1 Glossary of terms used in doors and windows

4.2 Doors – different types of doors

4.3 Windows – different types of windows

4.4 Purpose of use of arches and lintels

## **5 Floors, Roofs and Stairs**

5.1 Floors: Glossary of terms ,Types of floor finishes – cast-in-situ, concrete flooring(monolithic, bonded), terrazzo tile flooring, cast in situ Terrazzo flooring, timber flooring (Concept only)

5.2 Roofs: Glossary of terms, Types of roofs, concept and function of flat, pitched, hipped and Sloped roofs

5.3 Stairs: Glossary of terms; Stair case, winder, landing, stringer, newel, baluster, rise, tread, width of stair case, hand rail, nosing, head room, mumty room.

5.4 Various types of stair case – straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair, cantilever stair, tread riser stair.

## **6 Protective, Decorative Finishes, Damp and Termite Proofing**

6.1 Plastering – purpose – Types of plastering, Types of plaster finishes – Grit finish, rough cast, smooth cast, sand faced, pebble dash, acoustic plastering and plain plaster etc.

6.2 Proportion of mortars used for different plasters, preparation of mortars, techniques

of plastering and curing

6.3 Pointing – purpose –Types of pointing

6.4 Painting – objectives – method of painting new and old wall surfaces, wood surface and metal surfaces – powder coating and spray painting on metal surfaces.

6.5 White washing – Colour washing – Distempering – internal and external walls.

6.6 Damp and Termite proofing – Materials and Methods.

## **7 Green Buildings, Energy Management and Energy Audit Of Buildings & Project**

8.1 Concept of green building

8.2 Introduction to Energy Management and Energy Audit of Buildings.

8.3 Aims of energy management of buildings.

8.4 Types of energy audit, Response energy audit questionnaire

8.5 Energy surveying and audit report.

**F. Course Coverage up to Internal Assessment:** All of Part A and Chapters 1, 2 of Part B

### **G. RECOMMENDED BOOKS**

<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	N. Subramanian	Building materials & Construction	Oxford Publication
2	Rangwala	Engineering Materials	Charorar Publishing House
3	Rangwala	Building Construction	Charorar Publishing House
4	Sarkar & Saraswati	Construction Technology	Oxford Publication

## Th4. ESTIMATION & COST EVALUATION – I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4 <sup>th</sup>
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

The course enables the students to be ready to act as estimator and prepare necessary plans before construction satisfying the requirements imposed by different regulatory bodies. Further, the course helps them realize the organizational hierarchy and professional roles.

### B. COURSE OBJECTIVES

On completion of the course, students will be able to –

1. Understand the significance of accurate estimation practices.
2. Evaluate and generate component wise estimates for a building
3. Develop a proper cost estimate for single storeyed building.
4. Analyse and offer reason behind the costs involved in different components
5. Prepare abstract of cost estimates in line with prescription by state regulating bodies.
6. Realize the levels existing in organization and comprehend the roles and responsibilities at different levels.

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Introduction :	02
2	Quantity Estimate of Building	30
3	Analysis of Rates and Valuation.	22
4	Administrative Set-Up of Engineering Organisations	04

### D. COURSE CONTENTS:

#### 1 Introduction

- 1.1 Types of estimates – Plinth area, floor area / carpet area
- 1.2 Units and modes of measurements as per IS 1200

1.3 Accuracy of measurement for different item of work

**2 Quantity Estimate of Building**

2.1 Short wall long wall method and centre line method, deductions in masonry, plastering, white washing, painting etc., multiplying factor (paint coefficients) for painting of doors and windows (paneled/glazed), grills etc.

2.2 Detailed estimate of single storied flat roof building with shallow foundation and RCC roof slab with leak proof treatment over it including staircase and mummy room.

**3 Analysis of Rates and Valuation**

3.1 Analysis of rates for cement concrete, brick masonry in Cement Mortar, laterite stone masonry in Cement Mortar, cement plaster, white washing, Artificial Stone flooring, Tile flooring, concrete flooring, R.C.C. with centering and shuttering, reinforcing steel, Painting of doors and windows etc. as per OPWD.

3.2 Calculation of lead, lift, conveyance charges, royalty of materials, etc. as per Orissa P.W.D. system (Concept of C.P.W.D./Railways provisions)

3.3 Abstract of cost of estimate.

3.4 Valuation- Value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation and obsolescence, methods of valuation.

**4 Administrative Set-Up of Engineering Organisations:**

4.1 Administrative set-up and hierarchy of Engineering department in State Govt./Central Govt./PSUs/Private Sectors etc. Duties and responsibilities of Engineers at different positions /levels.

**E. Course Coverage up to Internal Assessment:** Chapters 1, 2

**F. Recommended Books**

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	M.Chakraborty.	Estimating, Costing, specification &Valuation in Civil Engineering	Published by author
3	B.N.Dutta	Estimating &Costing	UBSPD
4	A. Panigrahi	Accounts & contracts	Vikas Publication
5	Govt. of Odisha	Latest Orissa PWD Schedule of Rates & Analysis of rates	Govt. of Odisha

**B: The use of schedule and analysis of rates of Govt. of Odisha is allowed in the end examination.**

## Th5. ENVIRONMENTAL STUDIES

### (Common to All Branches)

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3 <sup>rd</sup>
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination	80

#### A. Rationale:

Due to various aspects of human developments including the demand of different kinds of technological innovations, most people have been forgetting that, the Environment in which they are living is to be maintained under various living standards for the preservation of better health. The degradation of environment due to industrial growth is very much alarming due to environmental pollution beyond permissible limits in respect of air, water industrial waste, noise etc. Therefore, the subject of Environmental Studies to be learnt by every student in order to take care of the environmental aspect in each and every activity in the best possible manner.

#### B. OBJECTIVES:

After completion of study of environmental studies, the student will be able to:

1. Gather adequate knowledge of different pollutants, their sources and shall be aware of solid waste management systems and hazardous waste and their effects.
2. Develop awareness towards preservation of environment.

#### C. TOPIC WISE DISTRIBUTION OF PERIODS

SL.NO.	TOPIC	PERIODS
1	The Multidisciplinary nature of environmental studies	04
2	Natural Resources	10
3	Systems	08
4	Biodiversity and it's Conservation	08
5	Environmental Pollution.	12
6	Social issues and the Environment	10
7	Human population and the environment	08
	<b>TOTAL</b>	<b>60</b>

#### Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

#### Unit 2: Natural Resources

##### Renewable and non renewable resources:

- a) Natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
- Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, .
- Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- Land Resources: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification.

b) Role of individual in conservation of natural resources.

c) Equitable use of resources for sustainable life styles.

### **Unit 3: Systems**

- Concept of an eco system.
- Structure and function of an eco system.
- Producers, consumers, decomposers.
- Energy flow in the eco systems.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco system:
- Forest ecosystem:
- Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries).

### **Unit 4: Biodiversity and it's Conservation**

- Introduction-Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and optin values.
- Biodiversity at global, national and local level.
- Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts.

### **Unit 5: Environmental Pollution.**

Definition Causes, effects and control measures of:

- a) Air pollution.
- b) Water pollution.
- c) Soil pollution
- d) Marine pollution
- e) Noise pollution.
- f) Thermal pollution
- g) Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Disaster management: Floods, earth quake, cyclone and landslides.

#### **Unit 6: Social issues and the Environment**

- Form unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, water shed management.
- Resettlement and rehabilitation of people; its problems and concern.
- Environmental ethics: issue and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
- Air (prevention and control of pollution) Act.
- Water (prevention and control of pollution) Act.
- Public awareness.

#### **Unit 7: Human population and the environment**

- Population growth and variation among nations.
- Population explosion- family welfare program.
- Environment and human health.
- Human rights.
- Value education
- Role of information technology in environment and human health.

#### **Syllabus coverage upto I.A**

#### **Units 1, 2, 3**

<b>Learning Resources:</b>			
<b>SI.No</b>	<b>Title of the Book</b>	<b>Name of Authors</b>	<b>Name of Publisher</b>
1.	Textbook of Environmental studies	Erach Bharucha	#UGC
2.	Fundamental concepts in Environmental Studies	D.D. Mishra	S.Chand&Co-Ltd
3.	Text book of Environmental Studies	K.Raghavan Nambiar	SCITECH Publication Pvt. Ltd
4.	Environmental Engineering	V.M.Domkundwar	Dhanpat Rai & Co

# Pr1. CIVIL ENGINEERING LABORATORY-I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3 <sup>rd</sup>
Total Period:	90	Examination	3 hrs
Lab. periods:	6P/week	Term Work	50
Maximum marks:	150	End Semester Examination:	100

## A. RATIONALE

The course exposes the students to different test facilities and their usage methods to determine characteristics of Civil Engineering materials.

## B. COURSE OBJECTIVES

C. On completion of the course, students will be able to –

1. Use Universal testing machine to determine the stress-strain relation in steel.
2. Carry out tests to determine cement characteristics and strength.
3. Investigate properties of aggregates
4. Conduct tests to determine concrete workability and compressive strength
5. To perform non-destructive tests on concrete
6. To conduct strength tests on different types of bricks

## D. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	MATERIAL TESTING LABORATORY	60
2	CONCRETE LABORATORY	30

## E. COURSE CONTENTS

### I. Material Testing Laboratory:

#### 1. Test on Steel

Determination of Young's Modulus of steel in a tensile testing machine.

#### 2. Tests on Cement, Sands, Bricks, Blocks & Aggregates

- 2.1 Determination of fineness of Cement by sieving.
- 2.2 Determination of normal Consistency, initial and final setting time of Cement
- 2.3 Determination of soundness of Cement by Le-Chatelier apparatus.
- 2.4 Determination of Compressive Strength of cement.
- 2.5 Determination of Compressive Strength of Burnt clay, Fly Ash Bricks and Blocks.



- 2.6 Grading of Fine & Coarse aggregate by sieving for concrete .
- 2.7 Determination of Specific Gravity and Bulking of sand.
- 2.8 Determination of Specific Gravity and Bulk density of coarse aggregate.
- 2.9 Grading of Road Aggregates.
- 2.10 Determination of Flakiness, Elongation of Road aggregates.
- 2.11 Determination of Crushing Value Test of aggregates.
- 2.12 Los-Angeles Abrasion Test of aggregate.
- 2.13 Impact test of aggregate.
- 2.14 Determination of soundness test of road aggregates.

## II. Concrete Laboratory

- 3.1 Determination of Compressive Strength of concrete cubes.
- 3.2 Determination of Workability of concrete by:
  - a) Slump Cone method,
  - b) Compaction Factor method.
- 3.3 Non Destructive tests on Concrete:
  - a) Demonstration on Rebound hammer
  - b) Ultrasonic Pulse Velocity measuring Instrument.

## F. RECOMMENDED BOOKS

Learning Resources			
Text Books			
Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	M. L. Gambhir	Concrete Manual-A Laboratory Manual For Quality of Concrete	Dhanpat Rai & Co. Pvt. Ltd.
2	Dr. M.Chakraborty	Cement,Aggregate and concrete Laboratory Manual	
3	S.K.Khanna & C.E.G.Justo	Highway material testing Laboratory manual	Nem Chand & Bros,Roorkee,India
4	Ajay K. Duggal & Vijay P Puri	Laboratory manual in Highway Engg.	New Age Int.Publishers
5	Dr.M.R.Samal	Civil Engineering Laboratory Practice-I	Kalyani Publishers

## Pr2. CIVIL ENGINEERING DRAWING-I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	3 <sup>rd</sup>
Total Period:	75	Examination	2 hrs
Theory periods:	5P/week	Term Work	25
Maximum marks:	75	End Semester Examination:	50

### A. RATIONALE

The course aims to prepare the students to use modern engineering tools to prepare building drawings.

### B. COURSE OBJECTIVES

After completion of the course, students will be able to

CO1- Use AutoCAD modules to prepare engineering drawings

CO2- Comprehend various drawing commands available in CAD software

CO3- Prepare plan, elevation and section views of flat roof buildings

CO4- Prepare plan, elevation and section views of inclined roof buildings

CO5- Generate drawings of building citing material differences

CO6- Generate building plans following prescribed regulations in established codes.

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	AutoCAD software	25
2	Plan, elevation and sectional elevation of flat roof building from line diagram and given specifications using AutoCAD software	25
3	Plan, elevation and section of inclined roof building with a/c sheet/gci/tiles on wooden structure using AutoCAD software	10
4	Building planning	15

### D. COURSE CONTENTS

#### 1. AutoCAD SOFTWARE.

1.1 Recap of the Draw, Format, Edit, Dimension, Modify commands

1.2 Draw 2D drawings of the following Building Components - Doors, Windows, Cross section through wall, Spread footing, Column footing, Stairs case, R.C.C. T-beam and slab

1.3 Develop Isometric drawings of simple objects

1.4 Develop 3D drawings of simple objects.

#### 2 PLAN, ELEVATION AND SECTIONAL ELEVATION OF FLAT ROOF BUILDING FROM LINE DIAGRAM AND GIVEN SPECIFICATIONS with use of AutoCAD software.

2.1 Plan at window sill level of a single storeyed R.C. roof slab building with elevation and sectional views form given line diagram and specification.

2.2 Detail drawing of Double storeyed pucca building with R.C.C. stair case from line diagram and given specification.

**2.3** Preparation of approval drawing of a residential building as per the norms of local approving authority with site plan, index plan etc.

**3 PLAN, ELEVATION AND SECTION OF INCLINED ROOF BUILDING WITH AC SHEET/GCI/TILES ON WOODEN STRUCTURE with use of AutoCAD Commands**

Detail drawing of inclined roof building from given line diagram and specification. (gabled / hipped)

**4. BUILDING PLANNING**

**4.1** Planning of buildings for specific cost based on approximate plinth area rate.

**4.2** Orientation of buildings, location of openings and living areas.

**4.3** Line plan of School, hostel, market complex and dispensary building.

**E. RECOMMENDED BOOKS**

Learning Resources			
Text Books			
Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	M.Chakrobarty	Civil Engg. Drawing	M.Chakrobarty
2	B.P.Verma	Civil Engineering drawing &House Planning	Khanna Publishers
3	Govt Of India	IS12556, 10713&I.S-696	BIS Publication
4	V.Thanikachalama & K.V Natarajan	Civil Engineering drawing Manual	S Chand & Co Pvt Ltd
5	G.V.Krishnan & Thomas A. Stellman	Harnessing AutoCAD	Delmar Cengage Learning
	George Omura	Mastering AutoCAD	Sybex
	William G. Wyatt	AutoCAD (Architecture) –latest edition	Delmar Cengage Learning

## Pr3. ESTIMATING PRACTICE

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4 <sup>th</sup>
Total Period:	45	Examination	
Lab. periods:	3 P/week	Term Work	25
Maximum marks:	25	End Semester Examination:	00

### A. RATIONALE

The course will enable the students to develop detailed estimate and prepare bill of materials essential for buildings in accordance with prescribed codes.

### B. COURSE OBJECTIVES

After completion of the course, students will be able to

CO1- Prepare estimates for 2 room single storey building

CO2- Prepare estimate for 2 storeyed buildings

CO3- Comprehend the schedule and analysis of rates offered by State Works Department

CO4- Use MS Excel to prepare analysis of rates

CO5- Evaluate dry material list and cost associated using MS Excel

CO6- Prepare abstract of costs and bill of materials for single storey and double storey buildings

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Estimate for plinth area	21
2	Analysis of rates	09
3	Dry material calculation	09
4	Cost estimate and bill of quantities	06

### D. COURSE CONTENTS

- 1.0 Preparation of plinth area estimate & detailed estimate for the following ;
  - 1.1 Single storeyed two roomed building with specification as per Orissa P.W.D. schedule of rates and analysis of rates
  - 1.2 A two storeyed pucca Building with specification as per Orissa P.W.D. schedule of rates and analysis of rates
- 2.0 Analysis of rates in detail for the above items of works basing on Orissa Govt. analysis of rate with help of **MS Excel software**.
- 3.0 Calculation of dry materials for different items of building basing on Orissa Govt. analysis of rate with help of **MS Excel software**
- 4.0 Preparation of abstract of cost and bill of quantities of the estimates as per item no. 1.0 above with help of **MS Excel software**

## E. RECOMMENDED BOOKS

Learning Resources			
Text Books			
Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	M.Chakrobarty	Estimating,Costing,specification &Valuation in Civil Engineering	Chakrobarty
2	B.N.Dutta	Estimating &Costing in Civil Engg.	UBS Publishers' Distributors Pvt. Ltd
3	G.S.Birdie	Text Book of Estimating &Costing	Dhanpat Rai Publishing Company Pvt. Ltd
4	Govt. of Odisha	Latest Orissa PWD Schedule of Rates & Analysis of rates	Govt. of Odisha

# STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

## TEACHING AND EVALUATION SCHEME FOR 4th Semester (Civil Engineering)(wef 2019-20)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		<b>Theory</b>							
Th.1		Structural Design - I	5		-	20	80	3	100
Th.2		Hydraulic and Irrigation Engineering	5		-	20	80	3	100
Th.3		Land Surveying – I	5		-	20	80	3	100
Th.4		Highway Engineering	5			20	80	3	100
		<i>Total</i>	<i>20</i>			<i>80</i>	<i>320</i>	<i>-</i>	<i>400</i>
		<b>Practical</b>							
Pr.1		Land Survey Practice-I	-	-	7	50	100	3	150
Pr.2		Civil Engg. Drawing-II	-	-	6	50	100	3	150
Pr.3		Technical Seminar			3	50			50
		Student Centered Activities(SCA)		-	3				
		<i>Total</i>	<i>-</i>	<i>-</i>	<i>19</i>	<i>150</i>	<i>200</i>	<i>-</i>	<i>350</i>
		<b>Grand Total</b>	<b>20</b>	<b>-</b>	<b>19</b>	<b>230</b>	<b>520</b>	<b>-</b>	<b>750</b>

Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.

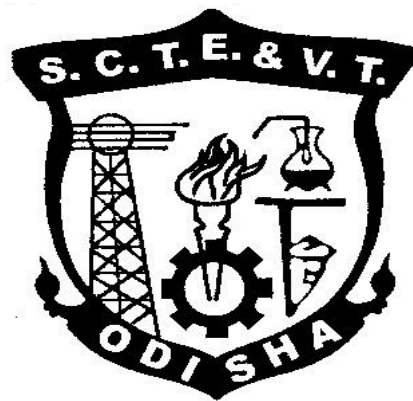
There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

# **CURRICULLUM OF 4<sup>TH</sup> SEMESTER**

**For**

**DIPLOMA IN CIVIL ENGINEERING**

**(Effective FROM 2019-20 Session)**



**STATE COUNCIL FOR TECHNICAL  
EDUCATION & VOCATIONAL TRAINING,  
ODISHA, BHUBANESWAR**

# Th1. STRUCTURAL DESIGN – I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4 <sup>th</sup>
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

*(Use of only IS 456 code is allowed in the written examination)*

## A. RATIONALE

The course will enable the students to undertake activities relating to the Design of simple Civil structural elements in view of load conditions and regulations imposed by standard or codes.

## B. COURSE OBJECTIVES

On completion of the subject a student will be able to –

1. Comprehend design philosophies and compare those
2. Refer the design codes
3. Design simple R.C. structural elements
4. Draw structural details for construction
5. Analyze and design structural elements such as beams, columns, staircase etc
6. Design formwork and scaffolding.

## C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Periods
1	Working stress method (WSM)	05
2	Philosophy of Limit state method (LSM)	03
3	Analysis and design of singly and double reinforced sections (LSM)	15
4	Shear, Bond and Development Length (LSM)	04
6	Analysis and Design of T-Beam (LSM)	15
7	Analysis and Design of Slab and Stair case (LSM)	15
8	Design of Axially loaded columns and Footings (LSM)	18

## D. COURSE CONTENTS:

(The codal provision for I.S.456 – 2000 along with other codes are to be followed)

### 1 Working stress method (WSM)

- 1.1 Objectives of design and detailing. State the different methods of design of concrete structures.
- 1.2 Introduction to reinforced concrete, R.C. sections their behavior, grades of concrete and steel. Permissible stresses, assumption in W.S.M.
- 1.3 Flexural design and analysis of single reinforced sections from first principles.
- 1.4 Concept of under reinforced, over reinforced and balanced sections.



1.5 Advantages and disadvantages of WSM, reasons for its obsolescence.

## **2 Philosophy Of Limit State Method (LSM)**

- 2.1 Definition, Advantages of LSM over WSM, IS code suggestions regarding design philosophy.
- 2.2 Types of limit states, partial safety factors for materials strength, characteristic strength, characteristic load, design load, loading on structure as per I.S. 875
- 2.3 Study of I.S specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column & footing, minimum reinforcement in slab, beam & column, lapping, anchorage, effective span for beam & slab.

## **3 Analysis and Design of Single and Double Reinforced Sections (LSM)**

- 3.1 Limit state of collapse (flexure), Assumptions, Stress-Strain relationship for concrete and steel, neutral axis, stress block diagram and strain diagram for singly reinforced section.
- 3.2 Concept of under- reinforced, over-reinforced and limiting section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for limiting singly R.C. section.
- 3.3 Analysis and design: determination of design constants, moment of resistance and area of steel for rectangular sections
- 3.4 Necessity of doubly reinforced section, design of doubly reinforced rectangular section

## **4 Shear, Bond and Development Length (LSM)**

- 4.1 Nominal shear stress in R.C. section, design shear strength of concrete, maximum shear stress, design of shear reinforcement, minimum shear reinforcement, forms of shear reinforcement.
- 4.2 Bond and types of bond, bond stress, check for bond stress, development length in tension and compression, anchorage value for hooks 90° bend and 45° bend standards lapping of bars, check for development length.
- 4.3 Numerical problems on deciding whether shear reinforcement is required or not, check for adequacy of the section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams (Explain through examples only).

## **5 Analysis and Design of T-Beam (LSM)**

- 5.1 General features, advantages, effective width of flange as per IS: 456-2000 code provisions.
- 5.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section with neutral axis lying within the flange.
- 5.3 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section when N.A. lies within or up to the bottom of flange shall be asked in written examination)..

## **6 Analysis and Design of Slab and Stair case (LSM)**

- 6.1 Design of simply supported one-way slabs for flexure check for deflection control and shear.
- 6.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear.
- 6.3 Design of two-way simply supported slabs for flexure with corner free to lift.
- 6.4 Design of dog-legged staircase
- 6.5 Detailing of reinforcement in stairs spanning longitudinally.

## **7 Design of Axially loaded columns and Footings (LSM)**

- 7.1 Assumptions in limit state of collapse- compression.
- 7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
- 7.3 Analysis and design of axially loaded short square, rectangular and circular columns (with lateral ties only).
- 7.4 Types of footing, Design of isolated square column footing of uniform thickness for flexure and shear.

**E. Syllabus Coverage up to Internal Assessment:** Chapters 1, 2, 3, 4

## F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	N.Subramanian	Design of Reinforced Concrete Structures	Oxford Pbln
2	N.C.Sinha,S.K.Roy	Fundamentals of Reinforced Concrete	S.Chand
3	H.J Saha.	Reinforced Concrete	Charotar Publishing house
4	Pillai & Menon.	Reinforced Concrete Structures	Tata McGraw Hill Education Private Limited
5	A.K. Jain.	Limit State Method (RCC Design )	Nem Chand & Bros
6	IS:456-2000		BIS Publication
7	SP-16		BIS Publication

## Th2. HYDRAULICS & IRRIGATION ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4 <sup>th</sup>
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

The course will be imparted in two parts. Primarily it aims to explain students the need of irrigation and components of the irrigation system which is covered in the second part of the course. The course aims to explain students the intricacies of irrigation engineering with reference to basic sciences relating to fluid mechanics and hydraulic machines. The essential components of fluid mechanics and hydraulic machines will be addressed in the first part of the course.

### B. COURSE OBJECTIVES

On completion of the course students will be able to -

1. Define common fluid properties and interpret results from pressure measuring instruments.
2. Realize the science behind fluid flow and compute fluid flow characteristics through notches, weirs, channels and pipes.
3. Realize the working principle of hydraulic pumps and evaluate their performance in general cases.
4. Comprehend the need of irrigation
5. Determine cause and effect of water logging
6. Comprehend the purpose of irrigation system components and elaborate on these

### C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name Of Topics	Periods
<i>PART: A (Hydraulics And Machines)</i>		
1	Hydrostatics	12
2	Kinematics Of Fluid Flow	18
3	Pumps	05
<i>Part: B (Irrigation Engineering)</i>		
1	Hydrology	04
2	Water Requirement Of Crops	04
3	Flow Irrigation	07
4	Water Logging And Drainage :	02
5	Diversion Head Works And Regulatory Structures	08
6	Cross Drainage Works :	07
7	Dams	08

## D. COURSE CONTENTS:

### ***PART: A (Hydraulics)***

- 1 **HYDROSTATICS:**
  - 1.1 **Properties of fluid:** density, specific gravity, surface tension, capillarity, viscosity and their uses
  - 1.2 **Pressure and its measurements:** intensity of pressure, atmospheric pressure, gauge pressure, absolute pressure and vacuum pressure; relationship between atmospheric pressure, absolute pressure and gauge pressure; pressure head; pressure gauges.
  - 1.3 **Pressure exerted on an immersed surface:** Total pressure, resultant pressure, expression for total pressure exerted on horizontal & vertical surface.
- 2 **KINEMATICS OF FLUID FLOW:**
  - 2.1 **Basic equation of fluid flow and their application:** Rate of discharge, equation of continuity of liquid flow, total energy of a liquid in motion- potential, kinetic & pressure, Bernoulli's theorem and its limitations. Practical applications of Bernoulli's equation.
  - 2.2 **Flow over Notches and Weirs:** Notches, Weirs, types of notches and weirs, Discharge through different types of notches and weirs-their application (No Derivation)
  - 2.3 **Types of flow through the pipes:** uniform and non uniform; laminar and turbulent; steady and unsteady; Reynold's number and its application
  - 2.4 **Losses of head of a liquid flowing through pipes:** Different types of major and minor losses. Simple numerical problems on losses due to friction using Darcy's equation, Total energy lines & hydraulic gradient lines (Concept Only).
  - 2.5 **Flow through the Open Channels:** Types of channel sections-rectangular, trapezoidal and circular, discharge formulae- Chezy's and Manning's equation, Best economical section.
- 3 **PUMPS:**
  - 3.1 **Type of pumps**
  - 3.2 **Centrifugal pump:** basic principles, operation, discharge, horse power & efficiency.
  - 3.3 **Reciprocating pumps:** types, operation, discharge, horse power & efficiency

### ***PART: B (Irrigation Engineering)***

- 1 **Hydrology**
  - 1.1 Hydrology Cycle
  - 1.2 Rainfall: types, intensity, hyetograph
  - 1.3 Estimation of rainfall, rain gauges, Its types(concept only),
  - 1.4 Concept of catchment area, types, run-off, estimation of flood discharge by Dicken's and Ryve's formulae
- 2 **Water Requirement of Crops**
  - 2.1 Definition of irrigation, necessity, benefits of irrigation, types of irrigation
  - 2.2 Crop season
  - 2.3 Duty, Delta and base period their relationship, overlap allowance, kharif and rabi crops
  - 2.4 Gross command area, culturable command area, Intensity of Irrigation, irrigable area, time factor, crop ratio

- 3 FLOW IRRIGATION**  
 3.1 Canal irrigation, types of canals, loss of water in canals  
 3.2 Perennial irrigation  
 3.3 Different components of irrigation canals and their functions  
 3.4 Sketches of different canal cross-sections  
 3.5 Classification of canals according to their alignment, Various types of canal lining – Advantages and disadvantages
- 4 WATER LOGGING AND DRAINAGE :**  
 4.1 Causes and effects of water logging, detection, prevention and remedies
- 5 DIVERSION HEAD WORKS AND REGULATORY STRUCTURES**  
 5.1 Necessity and objectives of diversion head works, weirs and barrages  
 5.2 General layout, functions of different parts of barrage  
 5.3 Silting and scouring  
 5.4 Functions of regulatory structures
- 6 CROSS DRAINAGE WORKS :**  
 6.1 Functions and necessity of Cross drainage works - aqueduct, siphon, super-passage, level crossing  
 6.2 Concept of each with help of neat sketch
- 7 DAMS**  
 7.1 Necessity of storage reservoirs, types of dams  
 7.2 Earthen dams: types, description, causes of failure and protection measures.  
 7.3 Gravity dam- types, description, Causes of failure and protection measures.  
 7.4 Spillways- Types (With Sketch) and necessity.

**E. Syllabus Coverage up to Internal Assessment: Part A:** Chapters 1, 2 & Part B: 1, 2

**F. RECOMMENDED BOOKS**

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	Modi & Seth	Fluid Mechanics & Hydraulic machines	Standard Book House
2	D.R. Biswal	Hydraulics & Fluid Mechanics	Kalyani Pbln
3	R.K.Rajput	A Text Book of Fluid Mechanics & Hydraulic machines	S.Chand

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	S.K.Garg	Irrigation Engineering & Hydraulics Structures	Khanna Publishers
2	N. N. Basak	Irrigation Engineering	TMH Publishing
3	S.K. Sharma	Irrigation Engineering & Hydraulic structures.	S. Chand Pbln

## Th3. LAND SURVEY – I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4 <sup>th</sup>
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

Survey is an essential prerequisite for all types of civil construction activities. This course aims to provide knowledge in area of plane survey and the survey instruments. Besides, the course aims to provide students in map reading and area computations from survey data.

### B. COURSE OBJECTIVES

On completion of the course students will be able to

1. Define various survey terminology and carryout necessary corrections for errors
2. Comprehend the principle, purpose, equipment and error corrections in chain and compass surveying
3. Comprehend the principle, purpose, equipment and error corrections in plane table and theodolite surveying
4. Comprehend the map nomenclature and apply skills in map interpretation
5. Gather skill towards leveling and contouring with knowledge of purpose and different methods thereof
6. Compute area and volume using different numerical algebraic methods

### C. Topic Wise Distribution of Periods

Chapter	Name of topics	Periods
1	Introduction To Surveying, Linear Measurements	07
2	Chaining and Chain Surveying	07
3	Angular Measurement and Compas Surveying	12
4	Map Reading Cadastral Maps & Nomenclature	07
5	Plane Table Surveying	07
6	Theodolite Surveying and Traversing:	15
7	Levelling and Contouring	15
8	Computation of Area & Volume	05

### D. Course Contents

- 1 **INTRODUCTION TO SURVEYING, LINEAR MEASUREMENTS:**
  - 1.1 Surveying: Definition, Aims and objectives
  - 1.2 Principles of survey-Plane surveying- Geodetic Surveying- Instrumental surveying.
  - 1.3 Precision and accuracy of measurements, instruments used for measurement of distance, Types of tapes and chains.
  - 1.4 Errors and mistakes in linear measurement – classification, Sources of errors and remedies.
  - 1.5 Corrections to measured lengths due to-incorrect length, temperature variation, pull, sag, numerical problem applying corrections.

**2**

**CHAINING AND CHAIN SURVEYING :**

- 2.1 Equipment and accessories for chaining
- 2.2 Ranging – Purpose, signaling, direct and indirect ranging, Line ranger – features and use, error due to incorrect ranging.
- 2.3 Methods of chaining –Chaining on flat ground, Chaining on sloping ground – stepping method, Clinometer-features and use, slope correction.
- 2.4 Setting perpendicular with chain & tape, Chaining across different types of obstacles –Numerical problems on chaining across obstacles.
- 2.5 Purpose of chain surveying, Its Principles, concept of field book. Selection of survey stations, base line, tie lines, Check lines.
- 2.7 Offsets – Necessity, Perpendicular and Oblique offsets, Instruments for setting offset – Cross Staff, Optical Square.
- 2.8 Errors in chain surveying – compensating and accumulative errors causes & remedies, Precautions to be taken during chain surveying.

**3**

**ANGULAR MEASUREMENT AND COMPAS SURVEYING :**

- 3.1 Measurement of angles with chain, tape & compass
- 3.2 Compass – Types, features, parts, merits & demerits, testing & adjustment of compass
- 3.3 Designation of angles- concept of meridians – Magnetic, True, arbitrary; Concept of bearings – Whole circle bearing, Quadrantal bearing, Reduced bearing, suitability of application, numerical problems on conversion of bearings
- 3.4 Use of compasses – setting in field-centering, leveling, taking readings, concepts of Fore bearing, Back Bearing, Numerical problems on computation of interior & exterior angles from bearings.
- 3.5 Effects of earth's magnetism – dip of needle, magnetic declination, variation in declination, numerical problems on application of correction for declination.
- 3.6 Errors in angle measurement with compass – sources & remedies.
- 3.7 Principles of traversing – open & closed traverse, Methods of traversing.
- 3.8 Local attraction – causes, detection, errors, corrections, Numerical problems of application of correction due to local attraction.
- 3.9 Errors in compass surveying – sources & remedies. Plotting of traverse – check of closing error in closed & open traverse, Bowditch's correction, Gales table

**4**

**MAP READING CADASTRAL MAPS & NOMENCLATURE:**

- 4.1 Study of direction, Scale, Grid Reference and Grid Square  
Study of Signs and Symbols
- 4.2 Cadastral Map Preparation Methodology
- 4.3 Unique identification number of parcel
- 4.4 Positions of existing Control Points and its types
- 4.5 Adjacent Boundaries and Features, Topology Creation and verification.

**5**

**PLANE TABLE SURVEYING :**

- 5.1 Objectives, principles and use of plane table surveying.
- 5.2 Instruments & accessories used in plane table surveying.
- 5.3 Methods of plane table surveying – (1) Radiation, (2) Intersection, (3) Traversing, (4) Resection.
- 5.4 Statements of TWO POINT and THREE POINT PROBLEM.  
Errors in plane table surveying and their corrections, precautions in plane table surveying.



## 6

### **THEODOLITE SURVEYING AND TRAVERSING:**

6.1 Purpose and definition of theodolite surveying

6.2 Transit theodolite- Description of features, component parts, Fundamental axes of a theodolite, concept of vernier, reading a vernier, Temporary adjustment of theodolite

6.3 Concept of transiting –Measurement of horizontal and vertical angles.

6.4 Measurement of magnetic bearings, deflection angle, direct angle, setting out angles, prolonging a straight line with theodolite, Errors in Theodolite observations.

6.5 Methods of theodolite traversing with – inclined angle method, deflection angle method, bearing method, Plotting the traverse by coordinate method, Checks for open and closed traverse.

6.6 Traverse computation – consecutive coordinates, latitude and departure, Gale's traverse table, Numerical problems on omitted measurement of lengths & bearings

6.7 Closing error – adjustment of angular errors, adjustment of bearings, numerical problems

6.8 Balancing of traverse – Bowditch's method, transit method, graphical method, axis method, calculation of area of closed traverse.

## 7

### **LEVELLING AND CONTOURING :**

7.1 Definition and Purpose and types of leveling– concepts of level surface, Horizontal surface, vertical surface, datum, R. L., B.M.

7.2 Instruments used for leveling, concepts of line of collimation, axis of bubble tube, axis of telescope, Vertical axis.

7.3 Levelling staff – Temporary adjustments of level, taking reading with level, concept of bench mark, BS, IS, FS, CP, HI.

7.4 Field data entry – level Book – height of collimation method and Rise & Fall method, comparison, Numerical problems on reduction of levels applying both methods, Arithmetic checks.

7.5 Effects of curvature and refraction, numerical problems on application of correction.

7.6 Reciprocal leveling – principles, methods, numerical problems, precise leveling.

7.7 Errors in leveling and precautions, Permanent and temporary adjustments of different types of levels.

7.8 Definitions, concepts and characteristics of contours.

7.9 Methods of contouring, plotting contour maps, Interpretation of contour maps, toposheets.

7.10 Use of contour maps on civil engineering projects – drawing cross-sections from contour maps, locating proposal routes of roads / railway / canal on a contour map, computation of volume of earthwork from contour map for simple structure.

7.11 Map Interpretation: Interpret Human and Economic Activities (i.e.: Settlement, Communication, Land use etc.), Interpret Physical landform (i.e.: Relief, Drainage Pattern etc.), Problem Solving and Decision Making

## 8

### **COMPUTATION OF AREA & VOLUME:**

8.1 Determination of areas, computation of areas from plans.

8.2 Calculation of area by using ordinate rule, trapezoidal rule, Simpson's rule.

8.3 Calculation of volumes by prismoidal formula and trapezoidal formula,  
Prismoidal corrections, curvature correction for volumes.

#### **E. SYLLABUS COVERAGE UPTO INTERNAL ASSESSMENT**

Chapters 1, 2, 3, 4, 5

#### **G. RECOMMENDED BOOKS**

<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	R.Subramanian	Surveying and Levelling	Oxford
2	Dr.B.C.Punmia.	Surveying, Vol.-I&II	Laxmi Publication
3	R. Agor	A text Book of Surveying & Levelling	Khanna Publishers
4	N.N Basak.	Surveying & Levelling	TMH Publishing

## Th4. HIGHWAY ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4 <sup>th</sup>
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

One of the major tasks carried out by civil engineering professionals is highway construction. Knowledge is essential on necessary geometric, materials, equipment essential for highway construction. The course aims to impart knowledge in this segment.

### B. COURSE OBJECTIVES

On completion of the course students will be able to -

1. Realize significance of the highway transportation and professional bodies associated with this,
2. Acquaint themselves with road geometric terms and understand the purpose of providing necessary features including angles and curvature during road construction.
3. Select proper road construction materials based on required properties and test data.
4. Comprehend the pavements and their types and know the step wise construction processes.
5. Acquire knowledge on common construction equipment
6. Realize essence of drainage and maintenance on the highways and prescribe related practices.

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Periods
1	Introduction	05
2	Road Geometrics	20
3	Road Materials	09
4	Road Pavements	13
5	Hill Roads	07
6	Road Drainage	07
7	Road Maintenance :	07
8	Construction equipments:	07

### D. COURSE CONTENTS:

#### 1 Introduction

- 1.1 Importance of Highway transportation: importance organizations like Indian roads congress, Ministry of Surface Transport, Central Road Research Institute.
- 1.2 Functions of Indian Roads Congress
- 1.3 IRC classification of roads
- 1.4 Organisation of state highway department

#### 2 Road Geometrics

	2.1 Glossary of terms used in geometric and their importance, right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation level, camber and gradient
	2.2 Design and average running speed, stopping and passing sight distance
	2.3 Necessity of curves, horizontal and vertical curves including transition curves and super elevation, Methods of providing super – elevation
3	<b>Road Materials</b>
	3.1 Difference types of road materials in use: soil, aggregates, and binders
	3.2 Function of soil as highway Subgrade
	3.3 California Bearing Ratio: methods of finding CBR valued in the laboratory and at site and their significance
	3.4 Testing aggregates: Abrasion test, impact test, crushing strength test, water absorption test & soundness test
4	<b>Road Pavements</b>
	4.1 Road Pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components
	Flexible pavements:
	4.2 Sub-grade preparation:
	Setting out alignment of road, setting out bench marks, control pegs for embankment and cutting, borrow pits, making profile of embankment, construction of embankment, compaction, stabilization, preparation of subgrade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for subgrade preparation
	4.3 Sub base Course:
	Necessity of sub base, stabilized sub base, purpose of stabilization (no designs)
	Types of stabilization
	<ul style="list-style-type: none"> <li>• Mechanical stabilization</li> <li>• Lime stabilization</li> <li>• Cement stabilization</li> <li>• Fly ash stabilization</li> </ul>
	4.4 Base Course:
	Preparation of base course, Brick soling, stone soling and metalling, Water Bound Macadam and wet-mix Macadam, Bituminous constructions: Different types
	4.5 Surfacing:
	<ul style="list-style-type: none"> <li>• Surface dressing</li> <li>    (i) Premix carpet and (ii) Semi dense carpet</li> <li>• Bituminous concrete</li> <li>• Grouting</li> </ul>
	4.6 Rigid Pavements:
	Concept of concrete roads as per IRC specifications
5	<b>Hill Roads:</b>
	5.1 Introduction: Typical cross-sections showing all details of a typical hill road in cut, partly in cutting and partly in filling
	5.2 Breast Walls, Retaining walls, different types of bends
6	<b>Road Drainage:</b>
	6.1 Necessity of road drainage work, cross drainage works
	6.2 Surface and sub-surface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage, intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross sections.
7	<b>Road Maintenance :</b>

- 7.1 Common types of road failures – their causes and remedies
- 7.2 Maintenance of bituminous road such as patch work and resurfacing
- 7.3 Maintenance of concrete roads – filling cracks, repairing joints, maintenance of shoulders (berm), maintenance of traffic control devices
- 7.4 Basic concept of traffic study, Traffic safety and traffic control signal

**8**

**Construction equipments:**

Preliminary ideas of the following plant and equipment:

- 8.1 Hot mixing plant
- 8.2 Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, graders, roller dragline
- 8.3 Asphalt mixer and tar boilers
- 8.4 Road pavers
- 8.5 Modern construction equipments for roads.

**E. SYLLABUS COVERAGE UPTO INTERNAL ASSESSMENT:**

Chapters 1, 2, 3, 4

**F. RECOMMENDED BOOKS**

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	S.K.Khanna & C.E.G. Justo	Highway Engineering	Nem Chand & Bros
2	S.P.Chandola	A Text Book Of Transportation Engineering	S. Chand
3	S.P.Bindra	A course on Highway engineering	Dhanpat Rai Publications
4	S.K. Sharma	Principles, practices & design of Highway Engineering.	S. Chand

## Pr1. LAND SURVEY PRACTICE-I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4 <sup>th</sup>
Total Period:	105	Examination	3hrs
Lab. periods:	7P/week	Term Work/Sessional	50
Maximum marks:	150	End Semester Examination:	100

### A. RATIONALE

The course prepares the students in use of survey instruments to conduct survey, present and interpret the generated data. This course, further, aims to enable students in map reading and computation of area from survey generated data. In addition, It introduces modern practice of survey that is photogrammetry which is applied in topographic mapping and site planning activities, along with the foundation for GIS information generation.

### B. COURSE OBJECTIVES

On completion of the course students will be able to

1. Undertake linear measurement activities using chains in absence or presence of obstacles
2. Conduct compass surveying and record data in necessary format
3. Read, interpret and verify a map
4. Setup plane table and conduct survey using different methods
5. Use of theodolite and plot the traverse and contour maps
6. Realize significance of photogrammetry as pictorial, accurate and permanent record and understand the basics of aerial photography
7. Acquire image through aerial and satellite platform and scanning thereof along with stereoscopic measurement
8. Generate DTM/DEM and ortho-image

### C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1	Linear Measurements, Chaining and Chain Surveying	05
2	Angular Measurement and Compass Surveying	12
3	Map Reading Cadastral Maps & Nomenclature	08
4	Plane Table Surveying	13
5	Theodolite Traversing	10
6	Levelling and Contouring	12
7	Basics of Aerial Photography	09
8	Basics of Photogrammetry, DEM and Ortho Image Generation	36

## **D. COURSE CONTENTS:**

### **1.0 Linear Measurements, Chaining and Chain Surveying:**

- 1.1 Testing and adjusting of a metric chain.
- 1.2 Measurement of distance between two points (more than 2 chain lengths apart) with chain including direct ranging.
- 1.3 Setting out different types of triangles, given the lengths of sides with chain and tape.
- 1.4 Measurement of distance between two points by chaining across a sloped ground using stepping method and a clinometer.
- 1.5 Measurement of distance by chaining across a obstacles on the chain line i) a pond ii) a building iii) a stream/ river (in the event of non-availability of stream / river, a pond or lake may be taken, considering that chaining around the same is not possible).
- 1.6 Setting perpendicular offsets to various objects (at least 3) from a chain line using-(1) tape, (2) cross-staff, (3) optical square and comparing the accuracy of the 3 methods
- 1.7 Setting oblique offsets to objects (at least 3) from a chain using tape

### **2.0 Angular Measurement and Compass Surveying:**

- 2.1 Testing and adjustment of Prismatic compass and Surveyor's compass.
- 2.2 Measurement of bearings of lines (at least 3 lines) and determination of included angles using Prismatic compass and Surveyor's compass.
- 2.3 Setting out triangles (at least 2) with compass, given the length and bearing of one side and included angles.
- 2.4 Setting out a closed traverse of 5 sides, using prismatic compass, given bearing of one line and included angles and lengths of sides.
- 2.5 Conducting chain and compass traverse surveying in a given plot of area (2plots) and recording data in the field book. (5 to 6 students/groups)

### **3.0 Map Reading Cadastral Maps & Nomenclature:**

- 3.1 Study of direction, Scale, Grid Reference and Grid Square
- 3.2 Study of Signs and Symbols
- 3.3 Cadastral Map Preparation Methodology
- 3.4 Unique identification number of parcel
- 3.5 Positions of existing Control Points and its types
- 3.6 Adjacent Boundaries and Features, Topology Creation and verification.

### **4.0 Plane Table Surveying:**

- 4.1 Setting up of Plane Table and Plotting five points by radiation method and five inaccessible points by intersection method.
- 4.2 Conducting Plane Table surveying in a given plot of area by traversing (Atleast a 5-sided traverse and locating the objects)
- 4.3 Plane table surveying by Resection method (two point & three point problem method)

### **5.0 Theodolite Traversing:**

- 5.1 Measurement of horizontal angles (3nos.) by repetition and reiteration method and compare two methods
- 5.2 Prolonging a given straight line with the help of a theodolite
- 5.3 Determination of magnetic bearing of 3 given straight lines

Setting out a closed traverse with 6 sides and entering the field data  
5.4 Plotting the traverse from exercise 4.1 and checking the error of closure  
5.5 Setting out an open traverse with 5 sides and entering the field data  
5.6 Plotting the traverse from exercise 4.3 and checking the error of closure

## **6.0 Leveling and Contouring:**

6.1 Making temporary adjustments of Levels  
6.2 Determining Reduced Levels of five given points taking staff readings with Levels.  
6.3 Determining the difference of levels between two points (3 pairs of points / group) by taking staff readings from single set up of level, recording the readings in level book and application of Arithmetic check. (At least 3 change points must be covered)  
6.4 Conduct Fly Leveling (Compound) between two distant points with respect to R.L. of a given B.M. and reduction of levels by both height of collimation and rise & fall method and applying Arithmetic check. (At least 3 change points must be covered)  
6.5 Conduct profile leveling along the given alignment for a road / canal for 150m length, taking L. S. at every 15m and C. S. at 1m & 3m apart on both sides at every 30m interval and recording the data in level book and applying arithmetical check.  
6.6 Locating contour points in the given area by direct method / indirect method  
6.7 Conducting block level survey in the given area  
6.8 Plotting and drawing contour map of a given area by radial method  
6.9 Map Interpretation: Interpret Human and Economic Activities (i.e.: Settlement, Communication, Land use etc.), Interpret Physical landform (i.e.: Relief, Drainage Pattern etc.), Problem Solving and Decision Making

## **7.0 Basics of Aerial Photography:**

7.1 Film  
7.2. Focal Length  
7.3. Scale  
7.4. Types of Aerial Photographs (Oblique, Straight)

## **8.0 Basics of Photogrammetry, DEM and Ortho Image generation:**

Photogrammetry:

8.1 Classification of Photogrammetry  
8.2 Aerial Photogrammetry  
8.3 Terrestrial Photogrammetry

Photogrammetry Process:

8.4 Acquisition of Imagery using aerial and satellite platform  
8.5 Control Survey  
8.6 Geometric Distortion in Imagery  
8.7 Application of Imagery and its support data  
8.8 Orientation and Triangulation  
8.9 Stereoscopic Measurement: X-parallax and Y-parallax  
8.10 DTM/DEM Generation  
8.11 Ortho Image Generation

## **E. RECOMMENDED BOOKS:**

- |                                       |                        |
|---------------------------------------|------------------------|
| ○ Surveying and Leveling              | - R.Subramanian        |
| ○ Surveying, Vol.-I&II                | -Dr.B.C.Punmia         |
| ○ A text Book of Surveying & Leveling | -R.Agor.               |
| ○ Surveying Part-III                  | - Dr.B.C.Punmia        |
| ○ Advanced Surveying                  | - D. Gaikwad, S. Chand |



## Pr2. CIVIL ENGINEERING DRAWING – II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	4 <sup>th</sup>
Total Period:	90	Examination	3 hrs
Lab. periods:	6 P/week	Term Work/Sessional	50
Maximum marks:	150	End Semester Examination:	100

### A. RATIONALE

The course aims to prepare the students to use modern engineering tools to prepare drawings of essential structures that include culverts, irrigation structures, sanitation components.

### B. COURSE OBJECTIVES

After completion of the course, students will be able to use AutoCAD or CAD softwares to

- Prepare RCC slab culvert drawings
- Prepare Hume pipe culvert drawings
- Prepare detailed drawings including plan, elevation and section views of irrigation structures
- Prepare detailed drawings of drainage siphons
- Generate drawings of plumbing and sanitary connections in two room buildings
- Generate detailed drawing of septic tanks

### C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1	Detailed drawing of culvert	25
2	Irrigation Structures	35
3	Plumbing and Sanitary connections	10
4	septic tank up to 50 users with soak pit	20

### D. COURSE CONTENT:

**(ALL THE DRAWINGS TO BE DONE USING AUTO CAD SOFTWARE ONLY)**

#### 1.0 Detailed drawing of culvert

Half foundation plan and half top plan, cross sectional elevation and longitudinal section of

- i) RCC Slab culvert with right angled wing wall
- ii) Hume pipe culvert with splayed wing wall

#### 2.0 Irrigation Structures

- 2.1 Detail drawing of a vertical drop type fall (Sarada Type) from given specifications
- 2.2 Drawing of a Drainage siphon from given specifications

#### 3 Plumbing and Sanitary connections and fittings of a two roomed building

#### 4 Detailed drawing of septic tank up to 50 users with soak pit and necessary connection from the water closet.

**E. RECOMMENDED BOOKS:**

- |  |                   |
|--|-------------------|
| 1. Civil Engg. Drawing   | -M.Chakrobarty.   |
| 2. Civil Engineering Drawing & House Planning                                    | -B.P.Verma.       |
| 3. A Course in Civil Engg Drawing  | -VB Sikka         |
| 3. Engineering graphics and design - K. Kumar, A.K. Ray & C. Ranjan- Vikas Pbln. |                   |
| 4. Auto Cad  | -Omura            |
| 5. AutoCAD (Architecture) 2011   | -William G. Wyatt |

### **Pr.3 -TECHNICAL SEMINAR**

Total Periods	03	Maximum Marks	50 Marks
Lab. Periods:	03 Periods /week	Term Work/Sessional	50Marks
Examination	3hours	End Semester Examination	--

Each student has to select a recent topic of latest technology in the area of Civil Engineering and present a seminar in front of all students of the class. He/She has to prepare a PowerPoint presentation of the selected topic and the total presentation will be approximately 10 minutes duration .There will be interactive session between the presenter and rest of the students including the faculty members of the dept at the end of presentation .A student has to present at least 2 nos.of seminar during a semester and to submit the report for evaluation.

### **CIVIL ENGG. CAD LABORATORY**

**(Can be used for Engg. Drawing/Civil Engg. Drawing-I & II /Estimation & Cost Evaluation Practice – I & II)**

**Gr. Size -30students**

<b>Sl. No.</b>	<b>Item with Specification-</b>	<b>QNTY in No.</b>
1	STAAD-Pro -V8i(Latest Educational Version – 15 user) software	1
2	AutoCAD-2016 or latest Educational version for minimum 15 users	1
3	Desk Top Computer with following latest version configuration : Processor: Intel Core i7 or higher version, CPU@2.3GHz or higher, Ram: 4GB or higher,MS Windows 64 bit operating system with 64 based processor etc.	30
4	Laptop Computer with following latest version configuration : Processor: Intel Core i7 or higher version, CPU@2.3GHz or higher, Ram: 4GB or higher,MS Windows 64 bit operating system with 64 based processor etc.	1
5	Online UPS: 5KVA	5
6	Laser Printer- Resolution in dpi: Mono 600x600, Paper size:A4, Print speed in ppm(A4 size):14, port:1 or higher configuration	1
7	Document Scanner A4/Legal size, Resolution: 600x600, Flat Bed size:A4	1
8	Plotter(44") with accessories in complete set	1
9	LCD projector 4000 ansi lumen with screen	1

**SURVEY PRACTICE I (For Gr., Size-30 students)**

Sl No.	Name of Equipments	Quantity required
1	Metallic Tape(15m,30m) in leather/fiber case and winding device as per BIS1492:1970	10
2	Steel Tape(3m,5m,15m & 30m) made of steel ribbon in leather/fiber case and winding device as per BIS1492:1970	02
3	Invar Tape(15m,30m) made of invar steel in leather/ fiber case and winding device as per BIS1492:1970	01
4	Cross Staff(Open type metallic)100X100X150 mm iron leg painted at bottom,1.5m length	10
5	Arrows(MS)	30
6	Ranging Rods(Iron) 2 & 3m length made of conduits of 30mm dia painted with white and black/red with iron shoes as per BIS2283:1983	30
7	Hammer	10
8	Prismatic Compass(150mm dia.) made of brass or gun metal Circles: Aluminum graduated every 30 minutes, Reading Agate stone bearing with help of prism glasses & reflecting mirror packed in fiber case with sighting vane and rigid stand and ball socket arrangement	06
9	Plane Table Surveying Plane Table consisting of Drawing Board 75cmX60cmX2cm made of seasoned pine wood/fire wood and braced with teak wood battens fitted with brass screws and washers in slots complete with metallic disc of 160 mm dia at base and confirming to BIS2539:1963;accessories comprising of magnetic trough compass confirming to BIS1764:1961,spirit level 15 cm long, plumb bob , 28cm long brass Ufork, alidade 45 cm long made of brass, one sided beveled edged wooden stand with metallic head and shoes.	10 sets
10	Telescopic Alidade size 175mm Internal focusing vertical circle graduated to read 30min with vernier, extendable base plate to 375mm and half degree divided giving angle of elevation and depression spirit level mounted on top telescope, telescope fitted with stadia diaphragm, vertical circle, to be supplied in teak wood box fully protected from dust	06
11	Automatic Level (as per BIS:4590) Telescope: Apperture of objective 45mm Field view1020' Magnification 32X Stadia Ratio 1:100 Addition Constant 0(zero) Minimum Focusing Distance1.5mm Range250meters Circular level with sensitivity per 2mm run10' mounted on sides of the telescope Accessories: Maintenance tools Leveling : Speedy Leveling by ball and socket arrangement. Tilting screw for final leveling Teak wood box, Tripod stand made of seasoned timber rigid with metal shoes	06
12	Leveling Staff: Aluminium-4 meter long in telescopic accurately painted in red and black on white background as per BIS 1779 and push type automatic locking system in canvas cover. Least Count- 0.005m /.001m	06

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

**TEACHING AND EVALUATION SCHEME FOR 5th Semester (Civil Engineering)(wef 2020-21)**

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Entrepreneurship and Management & Smart Technology	4		-	20	80	3	100
Th.2		Structural Design-II	4		-	20	80	3	100
Th.3		Railway & Bridge Engineering	4		-	20	80	3	100
Th.4		Water Supply & Waste Water Engineering	5			20	80	3	100
Th.5		Estimating & Cost Evaluation- II	4			20	80	3	100
		<i>Total</i>	21			100	400	-	500
		<b>Practical</b>							
Pr.1		Civil Engineering. Lab-II	-	-	6	50	100	3	150
Pr.2		Estimating Practice-II (Computer-Aided)	-	-	3	25	50	3	75
Pr.3		Project Phase-I	-	-	6	25	-	-	25
		Student Centred Activities(SCA)			3				
				-		-	-	-	-
		<i>Total</i>	-	-	18	100	150	-	250
		<b>Grand Total</b>	<b>21</b>	<b>-</b>	<b>18</b>	<b>200</b>	<b>550</b>	<b>-</b>	<b>750</b>

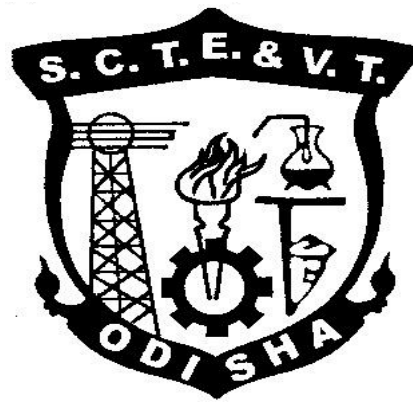
Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

**CURRICULLUM OF 5<sup>TH</sup> SEMESTER**  
**For**  
**DIPLOMA IN CIVIL ENGINEERING**  
**(Effective FROM 2020-21 Sessions)**



**STATE COUNCIL FOR TECHNICAL  
EDUCATION & VOCATIONAL TRAINING,  
ODISHA, BHUBANESWAR**

## Th1. ENTREPRENEURSHIP and MANAGEMENT & SMART TECHNOLOGY

(Common to All Branches)

Theory	4 Periods per week	Internal Assessment	20 Marks
Total Periods	60 Periods	End Sem Exam	80 Marks
Examination	3hours	Total Marks	100Marks

### Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Entrepreneurship	10
2	Market Survey and Opportunity Identification(Business Planning)	8
3	Project report Preparation	4
4	Management Principles	5
5	Functional Areas of Management	10
6	Leadership and Motivation	6
7	Work Culture, TQM & Safety	5
8	Legislation	6
9	Smart Technology	6
	TOTAL	60

### RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students, so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skill helps the student in the job market. The students can also be introduced with Startup and Smart Technology concept, which shall radically change the working environment in the coming days in the face of Industry 4.0

*In this subject, the Students shall be introduced/ exposed to different concepts and Terminologies in brief only, so that he/she can have broad idea about different concepts/items taught in this subject. Solving numerical problem on any topic/item is beyond the scope of this subject.*

### OBJECTIVES

After undergoing this course, the students will be able to :

- Know about Entrepreneurship, Types of Industries and Startups
- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- know the management Principles and functional areas of management
- Inculcate leadership qualities to motivate self and others.
- Maintain and be a part of healthy work culture in an organisation.
- Use modern concepts like TQM
- Know the General Safety Rules
- Know about IOT and its Application in SMART Environment.

### DETAILED CONTENTS

#### 1. Entrepreneurship

- Concept /Meaning of Entrepreneurship
- Need of Entrepreneurship
- Characteristics, Qualities and Types of entrepreneur, Functions
- Barriers in entrepreneurship
- Entrepreneurs vrs. Manager



- Forms of Business Ownership: Sole proprietorship, partnership forms and others
- Types of Industries, Concept of Start-ups
- Entrepreneurial support agencies at National, State, District Level( Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc.
- Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

## 2. **Market Survey and Opportunity Identification (Business Planning)**

- Business Planning
- SSI, Ancillary Units, Tiny Units, Service sector Units
- Time schedule Plan, Agencies to be contacted for Project Implementation
- Assessment of Demand and supply and Potential areas of Growth
- Identifying Business Opportunity
- Final Product selection

## 3. **Project report Preparation**

- Preliminary project report
- Detailed project report, Techno economic Feasibility
- Project Viability

## 4. **Management Principles**

- Definitions of management
- Principles of management
- Functions of management (planning, organising, staffing, directing and controlling etc.)
- Level of Management in an Organisation

## 5. **Functional Areas of Management**

### a) Production management

- Functions, Activities
- Productivity
- Quality control
- Production Planning and control

### b) Inventory Management

- Need for Inventory management
- Models/Techniques of Inventory management

### c) Financial Management

- Functions of Financial management
- Management of Working capital
- Costing (only concept)
- Break even Analysis
- Brief idea about Accounting Terminologies: Book Keeping, Journal entry, Petty Cash book, P&L Accounts, Balance Sheets(only Concepts)

### d) Marketing Management

- Concept of Marketing and Marketing Management
- Marketing Techniques (only concepts)
- Concept of 4P s (Price, Place, Product, Promotion)

### e) Human Resource Management

- Functions of Personnel Management
- Manpower Planning, Recruitment, Sources of manpower, Selection process, Method of Testing, Methods of Training & Development, Payment of Wages

6. **Leadership and Motivation**

- a) Leadership
  - Definition and Need/Importance
  - Qualities and functions of a leader
  - Manager Vs Leader
  - Style of Leadership (Autocratic, Democratic, Participative)
- b) Motivation
  - Definition and characteristics
  - Importance of motivation
  - Factors affecting motivation
  - Theories of motivation (Maslow)
  - Methods of Improving Motivation
  - Importance of Communication in Business
  - Types and Barriers of Communication

7. **Work Culture, TQM & Safety**

- Human relationship and Performance in Organization
- Relations with Peers, Superiors and Subordinates
- TQM concepts: Quality Policy, Quality Management, Quality system
- Accidents and Safety, Cause, preventive measures, General Safety Rules , Personal Protection Equipment(PPE)

8. **Legislation**

- a) Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights
- b) Features of Factories Act 1948 with Amendment (only salient points)
- c) Features of Payment of Wages Act 1936 (only salient points)

9. **Smart Technology**

- Concept of IOT, How IOT works
- Components of IOT, Characteristics of IOT, Categories of IOT
- Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc.

**Syllabus to be covered before IA:** Chapter 1,2,3,4

**RECOMMENDED BOOKS**

1. Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
2. Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh
3. Entrepreneurship Development and Management by Vasant Desai, Himalaya Pub.House
4. Industrial Engineering and Management by O.P Khanna ,Dhanpat Rai and Sons
5. Industrial Engineering and Management by Banga and Sharma, Khanna Publications
6. Internet of Things by Jeeva Jose, Khanna Publications, New Delhi
7. Online Resource on Startups and other concepts
8. <https://www.fundable.com/learn/resources/guides/startup>

## Th2. STRUCTURAL DESIGN– II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs
Theory periods:	4P / week	Internal Assessment :	20
Maximum marks:	100	End Semester examination:	80

### A. RATIONALE

The course aims at imparting skills to design structural members. This will enable the students to recognize the load conditions and possible failure locations so that student will be able to compute necessary dimensions to prevent failure.

### B. COURSE OBJECTIVES

On completion of the course, a student will be able to-

1. Design simple steel structure such as tension members, compression members and simple beams.
2. Design timber structural elements
3. Design staircase, footings by limit method of design.
4. Draw the details of a steel roof truss.
5. Draw the reinforcement details of underground RCC water tank and RCC footings.
6. Use standards and design codes.

### C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1	Introduction:	5
2	Structural Steel Fasteners and Connections.	10
3	Design of Steel tension Members	10
4	Design of Steel Compression members.	10
5	Design of Steel beams:	10
6	Design of Tubular Steel Structures	6
7	Design of Masonry Structures	9

### D. COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES

- 1 Introduction:**
  - 1.1 Common steel structures, Advantages & disadvantages of steel structures.
  - 1.2 Types of steel, properties of structural steel.
  - 1.3 Rolled steel sections, special considerations in steel design.
  - 1.4 Loads and load combinations.
  - 1.5 Structural analysis and design philosophy.
  - 1.6 Brief review of Principles of Limit State design.
- 2 Structural Steel Fasteners and Connections.**
  - 2.1 Bolted Connections
    - 2.1.1 Classification of bolts, advantages and disadvantages of bolted connections.

- 2.1.2 Different terminology, spacing and edge distance of bolt holes.
- 2.1.3 Types of bolted connections.
- 2.1.4 Types of action of fasteners, assumptions and principles of design.
- 2.1.5 Strength of plates in a joint, strength of bearing type bolts (shear capacity & bearing capacity), reduction factors, and shear capacity of HSFG bolts.
- 2.1.6 Analysis & design of Joints using bearing type and HSFG bolts (except eccentric load and prying forces)
- 2.1.7 Efficiency of a joint.
- 2.2 Welded Connections:
  - 2.2.1 Advantages and Disadvantages of welded connection
  - 2.2.2 Types of welded joints and specifications for welding
  - 2.2.3 Design stresses in welds.
  - 2.2.4 Strength of welded joints.

### **3 Design of Steel tension Members**

- 3.1 Common shapes of tension members.
- 3.2 Maximum values of effective slenderness ratio.
- 3.4 Analysis and Design of tension members. (Considering strength only and concept of block shear failure.)

### **4 Design of Steel Compression members.**

- 4.1 Common shapes of compression members.
- 4.2 Buckling class of cross sections, slenderness ratio
- 4.3 Design compressive stress and strength of compression members.
- 4.4 Analysis and Design of compression members (axial load only).

### **5 Design of Steel beams:**

- 5.1 Common cross sections and their classification.
- 5.2 Deflection limits, web buckling and web crippling.
- 5.3 Design of laterally supported beams against bending and shear.

### **6 Design of Tubular Steel Structures:**

- 6.1 Round Tubular Sections, Permissible Stresses
- 6.2 Tubular Compression & Tension Members
- 6.3 Joints in Tubular trusses

### **7 Design of Masonry Structures:**

- 7.1 Design considerations for Masonry walls & Columns, Load Bearing & Non-Load Bearing walls, Permissible stresses, Slenderness Ratio, Effective Length, Height & Thickness.

## **E. SYLLABUS COVERGE UPTO INTERNAL ASSESSMENT Chapters 1,2,3,4**

## **F. BOOKS RECOMMENDED**

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	B.N.Duggal	Design of Steel Structures	McGraw Hill Education
2	Samal & Panigrahi	Elements of Steel ,Timber & Masonry Design	Kalyani Pbln
3	Samal & Panigrahi	Steel Tables	Kalyani Pbln
4	BIS.	1) I.S 800-Code of practice for General construction in steel	BIS

		<p>2) SP-20 Hand book on masonry design and construction- BIS Publication.</p> <p>3) IS 806: 1968 Code of practice for use of steel tubes in general building construction.</p> <p>4) IS 1161: 1998 Steel Tubes for Structural Purposes – Specification</p>	
--	--	---	--

## Th3. RAILWAY & BRIDGE ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5 <sup>th</sup>
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

The course will expose the students to the requirements posed by railways and bridges and how these requirements are different from roads. The course shall acquaint the students with common engineering terminology and prepares them to pursue higher courses in the aspect.

### B. COURSE OBJECTIVES

On completion of the course, students will be able to

1. Explain railway terminology
2. Comprehend the track components and relate to the material or geometric aspects that can be used for these
3. Describe methods of laying and maintaining the track
4. State the requirements for an ideal bridge and describe types of foundation and substructures
5. Classify the bridges and identify the components
6. Select the bridge sites in context of hydrologic requirements

### C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1	Introduction	2
2	Permanent way	5
3	Track materials	10
4	Geometric for broad gauge	10
5	Points and crossings	4
6	Laying & maintenance of track	4
Section – B: BRIDGES		
1	Introduction to bridges	2
2	Bridge site investigation, hydrology & planning	5
3	Bridge foundation	8
4	Bridge substructure and approaches	5
5	Culvert & Cause Ways	5

### D. COURSE CONTENTS:

#### Section – A: RAILWAYS

- 1 Introduction**
  - 1.1 Railway terminology
  - 1.2 Advantages of railways
  - 1.3 Classification of Indian Railways
- 2 Permanent way**
  - 2.1 Definition and components of a permanent way
  - 2.2 Concept of gauge, different gauges prevalent in India, suitability of these gauges

under different conditions

### **3 Track materials**

#### **3.1 Rails**

- 3.1.1 Functions and requirement of rails
- 3.1.2 Types of rail sections, length of rails
- 3.1.3 Rail joints – types, requirement of an ideal joint
- 3.1.4 Purpose of welding of rails & its advantages
- 3.1.5 Creep- definition, cause & prevention

#### **3.2 Sleepers**

- 3.2.1 Definition, function & requirements of sleepers
- 3.2.2 Classification of sleepers
- 3.2.3 Advantages & disadvantages of different types of sleepers

#### **3.3 Ballast**

- 3.3.1 Functions & requirements of ballast
- 3.3.2 Materials for ballast

#### **3.4 Fixtures for Broad gauge**

- 3.4.1 Connection of rails to rail-fishplate, fish bolts
- 3.4.2 Connection of rails to sleepers

### **4 Geometric for broad gauge**

- 4.1 Typical cross – sections of single & double broad gauge railway track in cutting and embankment
- 4.2 Permanent & temporary land width
- 4.3 Gradients for drainage
- 4.4 Super elevation – necessity & limiting valued

### **5 Points and crossings**

- 5.1 Definition, necessity of Points and crossings
- 5.2 Types of points & crossings with tie diagrams

### **6 Laying & maintenance of track**

- 6.1 Methods of Laying & maintenance of track
- 6.2 Duties of a permanent way inspector

## **Section – B: BRIDGES**

### **1 Introduction to bridges**

- 1.1 Definitions
- 1.2 Components of a bridge
- 1.3 Classification of bridges
- 1.4 Requirements of an ideal bridge

### **2 Bridge site investigation, hydrology & planning**

- 2.1 Selection of bridge site, Alignment,
- 2.2 Determination of Flood Discharge
- 2.3 Waterway & economic span
- 2.4 Afflux, clearance & free board

### **3 Bridge foundation**

- 3.1 Scour depth minimum depth of foundation
- 3.2 Types of bridge foundations – spread foundation, pile foundation- well foundation – sinking of wells, caission foundation

### 3.3 Cofferdams

## 4 Bridge substructure and approaches

4.1 Types of piers

4.2 Types of abutments

4.3 Types of wing walls

4.4 Approaches

## Culvert & Causeways

- 5
- 5.1 Types of culverts – brief description
- 5.2 Types of causeways – brief description

## E. SYLLABUS COVERAGE UPTO INTERNAL ASSESSMENT

Chapters 1,2,3,4 of Section A & Chapters 1,2 of Section B

## F. Recommended Books

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	Chandra & Agrawal	Railway Engineering	Oxford Publication
3	S.C.Sexena & S.P.Arora	A Text book of Railway Engineering	Dhanpat Rai Publications
4	S. C. Rangwala	Railway Engineering	Charotar Publication
5	S.P. Bindra	Bridge Engineering	Dhanpat Rai Publications



## Th4. WATER SUPPLY AND WASTE WATER ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5 <sup>th</sup>
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

The course aims to expose the students to the current state of water supply and sewage disposal system. Through the course the principles, purposes and the methods are covered at different stages of the activity, thus laying foundation in students to think of meeting futuristic challenges.

### B. COURSE OBJECTIVES

On completion of the course, students will be able to

1. Compute water demand in terms of quantity and quality
2. Describe the water sources, conveyance and distribution system
3. Realize the necessity of treatment and comprehend the principle and purpose of different water treatment processes
4. Comprehend the terminology relating to sanitary engineering and compute quantity & quality of sewage
5. Describe the sewerage system and its components stating the purposes thereof
6. Comprehend the necessity and method of sewage treatment and disposal

### C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
	SECTION A:WATER SUPPLY	
1	Introduction to Water Supply, Quantity and Quality of water	10
2	Sources and Conveyance of water	8
3	Treatment of water	12
4	Distribution system and Appurtenance in distribution system	8
5	W/s plumbing in building	2
	SECTION B:WASTE WATER ENGINEERING	
6	Introduction	5
7	Quantity and Quality of sewage	7
8	Sewerage system	5
9	Sewer appurtenances and Sewage Disposal	7
10	Sewage treatment	8
11	Sanitary plumbing for building	3

### D. COURSE CONTENTS:

#### SECTION A: WATER SUPPLY

#### 1 Introduction to Water Supply, Quantity and Quality of water

- 1.1 Necessity of treated water supply
- 1.2 Per capita demand, variation in demand and factors affecting demand

- 1.3 Methods of forecasting population, Numerical problems using different methods
- 1.4 Impurities in water – organic and inorganic, Harmful effects of impurities
- 1.5 Analysis of water –physical, chemical and bacteriological
- 1.6 Water quality standards for different uses

## **2 Sources and Conveyance of water**

- 2.1 Surface sources – Lake, stream, river and impounded reservoir
- 2.2 Underground sources – aquifer type & occurrence – Infiltration gallery, infiltration well, springs, well
- 2.3 Yield from well- method s of determination, Numerical problems using yield formulae ( deduction excluded)
- 2.4 Intakes – types, description of river intake, reservoir intake, canal intake
- 2.5 Pumps for conveyance & distribution – types, selection, installation.
- 2.6 Pipe materials – necessity, suitability, merits & demerits of each type
- 2.7 Pipe joints – necessity, types of joints, suitability, methods of jointing
- Laying of pipes – method

## **3 Treatment of water**

*Note:*

- 1. *Design of treatment units excluded.*
- 2. *Students may be asked to prepare detailed sketches of units, preferably from working drawing, as home assignment*
- 3. *Field visit to treatment plant, under practical should be arranged after covering this unit.*

3.1 Flow diagram of conventional water treatment system

3.2 Treatment process / units :

- 3.2.1 Aeration ; Necessity
- 3.2.2 Plain Sedimentation : Necessity, working principles, Sedimentation tanks – types, essential features, operation & maintenance
- 3.2.3 Sedimentation with coagulation: Necessity, principles of coagulation, types of coagulants, Flash Mixer, Flocculator, Clarifier (Definition and concept only)
- 3.2.4 Filtration : Necessity, principles, types of filters  
Slow Sand Filter, Rapid Sand Filter and Pressure Filter – essential features
- 3.2.5 Disinfection : Necessity, methods of disinfection  
Chlorination – free and combined chlorine demand, available chlorine, residual chlorine, pre-chlorination, break point chlorination, super-chlorination
- 3.2.6 Softening of water – Necessity, Methods of softening – Lime soda process and Ion exchange method (Concept Only)

## **4 Distribution system And Appurtenance in distribution system:**

- 4.1 General requirements, types of distribution system-gravity, direct and combined
- 4.2 Methods of supply – intermittent and continuous
- 4.3 Distribution system layout – types, comparison, suitability
- 4.4 Valves-types, features, uses, purpose-sluice valves, check valves, air valves, scour valves, Fire hydrants, Water meters

## **5 W/s plumbing in building :**

- 5.1 Method of connection from water mains to building supply
- 5.2 General layout of plumbing arrangement for water supply in single storied and multi-storied building as per I.S. code.

## SECTION B: WASTE WATER ENGINEERING

- 6 Introduction**  
6.1 Aims and objectives of sanitary engineering  
6.2 Definition of terms related to sanitary engineering  
6.3 Systems of collection of wastes– Conservancy and Water Carriage System – features, comparison, suitability
- 7 Quantity and Quality of sewage**  
7.1 Quantity of sanitary sewage – domestic & industrial sewage, variation in sewage flow, numerical problem on computation quantity of sanitary sewage.  
7.2 Computation of size of sewer, application of Chazy's formula, Limiting velocities of flow : self-cleaning and scouring  
7.3 General importance, strength of sewage, Characteristics of sewage-physical, chemical & biological  
7.4 Concept of sewage-sampling, tests for – solids, pH, dissolved oxygen, BOD, COD
- 8 Sewerage system**  
8.1 Types of system-separate, combined, partially separate , features, comparison between the types, suitability  
8.2 Shapes of sewer – rectangular, circular, avoid-features, suitability  
8.3 Laying of sewer-setting out sewer alignment
- 9 Sewer appurtenances and Sewage Disposal:**  
9.1 Manholes and Lamp holes – types, features, location, function  
9.2 Inlets, Grease & oil trap – features, location, function  
9.3 Storm regulator, inverted siphon – features, location, function  
9.4 Disposal on land – sewage farming, sewage application and dosing, sewage sickness-causes and remedies  
9.5 Disposal by dilution – standards for disposal in different types of water bodies, self purification of stream
- 10 Sewage treatment :**  
**(Note: 1.Design of treatment units excluded.**  
**2.Students may be asked to prepare detailed sketches of units, preferably from working drawing, as home assignment.**  
**3.Field visit to treatment plant, under practical should be arranged after covering this unit.)**  
10.1 Principles of treatment, flow diagram of conventional treatment  
10.2 Primary treatment – necessity, principles, essential features, functions  
10.3 Secondary treatment – necessity, principles, essential features, functions
- 11 Sanitary plumbing for building :**  
11.1 Requirements of building drainage, layout of lavatory blocks in residential buildings, layout of building drainage  
11.2 Plumbing arrangement of single storied & multi storied building as per I.S. code practice  
11.3 Sanitary fixtures – features, function, and maintenance and fixing of the fixtures – water closets, flushing cisterns, urinals, inspection chambers, traps, anti-syphonage pipe

## **E. SYLLABUS COVERGE UPTO INTERNAL ASSESSMENT**

Chapters 1, 2, 3, 4 from Section A & Chapters 6,7,8 from Section B

## **F. RECOMMENDED BOOKS**

<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	G.S.Birdie	Text book on water supply and sanitary engineering	Dhanpat Rai Publications
2	S.K.Garg	Water Supply Engineering	Khanna Publishers
3	S.K.Garg	Waste Water Disposal Engg.	Khanna Publishers
4	By Ministry of Urban Development,Govt. of India.	CPHEEO manual Water supply	
5	By Ministry of Urban Development,Govt. of India.	CPHEC Mannual- Sewage & Sewage Treatment - by Ministry of Urban Development,Govt.of India.	

## Th5. ESTIMATION & COST EVALUATION – II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

The course exposes the students to the techniques and best practices to prepare detailed estimates of roads, bridges, culverts, irrigation structures and PWD works.

### B. COURSE OBJECTIVES

On completion of the course, students will be able to

1. Create detailed estimate of culverts and bridges
2. Prepare estimates of irrigation structures
3. Prepare estimates of a macadam road and a national highway in cutting and filling
4. Prepare detailed estimates for septic tank and soak pits
5. Prepare detailed estimates of miscellaneous works
6. Comprehend the management practices in Public Works Department
7. Interpret the building bylaws furnished by regulatory bodies

### C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1.	Detailed estimate of culverts and bridges	12
2.	Estimate of irrigation structures	14
3.	Detailed estimate of roads	12
4.	Detailed estimates of miscellaneous works	12
5.	PWD accounts works	10

### D. COURSE CONTENTS:

#### 1. Detailed estimate of culverts and bridges

- 1.1 Detailed estimate of a RCC slab culvert with right angled wing walls with bar bending schedule.
- 1.2 RCC Hume pipe culvert with splayed angled wing wall

#### 2. Estimate of irrigation structures

- 2.1 Detailed estimate of simple type of vertical fall to given specification
- 2.2 Detailed estimate of drainage siphon to given specification.

#### 3. Detailed estimate of roads

- 3.1 Detail estimate of a water bound macadam road
- 3.2 Detailed estimate of a flexible pavement in cutting / filling
- 3.2 Detailed estimate of septic tank and soak pit for 50 users

#### 4. Miscellaneous estimates

4.1 Tube well, Piles and Pile cap, Isolated and combined footings.

## **5. PWD Accounts works**

### **5.1 Works**

5.1.1 Classification of work-original, major, petty, repair work, annual repair, special repair, quadrantal repair.

5.1.2 Concept of Method of execution of works through the contractors and department, contract and agreement, work order, types of contract, piece work agreement.

### **5.2 Accounts of works –**

#### **5.2.1 Explanation of various terms**

Administrative approval, technical sanction, tender, preparation of notice inviting tender, quotations, earnest money, E-tendering, security deposit, advance payment, intermediate payment, final payment, running bill, final bill, regular and temporary establishment, cash, major & subhead of account, temporary advance (imprest money), supervision charges, suspense account, debit, credit, book transfer, voucher and related accounts .

5.2.2 Measurement book use & maintenance, procedure of marking entries of measurement of work and supply of materials, labour employed, standard measurement books and common irregularity

5.2.3 Muster roll : Its preparation & use for making payment of pay & wages

5.2.4 Acquittance Roll : Its preparation & use for making payment of pay & wages

5.2.5 Labour & labour report, method of labour payment, use of forms and necessity of Submission

5.2.6 Classification of stores, receipt / issue statement on standard form, method of preparation of stock account, preparation and submission of returns, verification of stocks, shortage and excess

5.3 Building BYLAWS and REGULATORY Bodies, Development authorities, types and their levels, RERA etc.

## **E. SYLLABUS COVERGE UPTO INTERNAL ASSESSMENT**

Chapters 1, 2, 3

## **F. RECOMMENDED BOOKS**

<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	M.Chakraborty.	Estimating, Costing, specification & Valuation in Civil Engineering	Published by author
2	B.N.Dutta.	Estimating & Costing	UBSPD
3	Birdi & Ahuja.	Estimating & Costing	Dhanpat Rai Publication
4	Latest Orissa PWD Schedule of Rates & Analysis of rates		Govt. of Odisha

## Pr1. CIVIL ENGINEERING LABORATORY-II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	90	Examination	3 hrs
Practical periods:	6P/week	Sessional Marks:	50
Maximum marks:	150	Practical Examination:	100

### A. RATIONALE

The course aims to develop competence in conduct of experiments in line with prescribed standards and interpret the results. The objective is to enable the students gathering professional skills in working at research and testing laboratories. In the course students are required to conduct at least fifteen experiments selecting minimum three from each of the section furnished in course contents.

### B. COURSE OBJECTIVES

On completion of the course students will be able to

1. Prepare setups and specimens for experiments
2. Interpret the specimen specifications prescribed in standard test manuals and codes
3. Acquaint themselves with modern test equipment
4. Record the results in prescribed formats
5. Plot graphs and interpret the results
6. Analyze the results and predict possible trends

### C. TOPIC WISE DISTRIBUTION OF PERIODS

Chapter	Name of topics	Hours
1.	TESTS ON SOIL	36
2.	HYDRAULICS LABORATORY	18
3.	TRANSPORTATION LABORATORY	18
4.	PUBLIC HEALTH ENGINEERING LABORATORY	18

### D. COURSE CONTENTS

#### 1.0 TESTS ON SOIL :

- 1.1 Determination of Specific gravity of Soil by Pycnometer /Density bottle.
- 1.2 Determination of Field Density of Soil by Core Cutter Method.
- 1.3 Determination of Particle Size gradation of sand/Gravel by sieve analysis.
- 1.4 Wet mechanical analysis using pipette method for clay and silt.
- 1.5 (a)Determination of Liquid Limit by soil by Casagrande"s apparatus.  
(b)Determination of Plastic limit of soil.
- 1.6 Determination of Shrinkage limit of soil.
- 1.7 Determination of MDD & OMC of soil by using modified Proctor Test.
- 1.8 Determination of CBR value using Laboratory CBR Testing device.
- 1.9 Determination of  $c$  and  $\phi$  of soil by triaxial testing device.
- 1.10 Determination of coefficient of permeability of soil by constant head method.

## **2.0 HYRAULICS LABORATORY:**

- 2.1 Verification of Bernoulli's Theorem
- 2.3 Determination of coefficient of Discharge of a rectangular notch fitted in open Channel.
- 2.3 Determination of coefficient of Discharge of a Venturimeter, Orificemeter fitted in a pipe
- 2.4 Determination of head Loss due to friction and coefficient of friction for flow through pipe.

## **3.0 TRANSPORTATION LABORATORY:**

- 3.1 Penetration Test of Bitumen.
- 3.2 Ductility Test of Bitumen.
- 3.3 Viscosity Test of Bitumen.
- 3.4 Bitumen content by centrifuge extractor.

## **4.0 PUBLIC HEALTH ENGINEERING LABORATORY:**

- 4.1 Determination of Turbidity of water Sample using Turbidimeter/Nephelometer/Jackson's Candle Turbidimeter.
- 4.2 Determination of pH of Water sample using (a) pH – meter (b) colour Comparator.
- 4.3 Determination of Chloride content of a Water sample using method of titration.
- 4.4 Determination of Coagulant (Alum) dose requirement for a turbid water sample by Jar Test.
- 4.5 Determination of dissolved oxygen in a water sample.
- 4.6 Determination of bacteriological quality of water sample by Coliform test.

## **E. Recommended Books**

- |  |                                |
|--|--------------------------------|
| 1. Soil Testing                                      | -A. P. Mittal                  |
| 2. Civil Engineering laboratory Practice-II          | - Dr. M.R. Samal, Kalyani Pbln |
| 3. Highway material testing Laboratory manual        | -S.K.Khanna &C.E.G.Justo.      |
| 4. Laboratory manual in Highway material testing     | -Ajay K. Duggal,Vijaya p.      |
| 5. Laboratory work in Hydraulic Engineering          | -G.L.Asawa.                    |
| 6. Experimental Hydraulics                           | -S.N. Ghosh & S.C Talapatra.   |
| 7. Laboratory manual in Environmental Engineering    | -Prof.P.D.Kulkarni.            |
| 8. Experimental Hydraulics                           | - S.N. Ghosh &S.C Talapatra,   |
| 9. Hydraulics Laboratory Manual                      | - S.K.Likhi.                   |
| 10. Principles, Practice and design of Highway Engg. | - S.K.Sharma – S.Chand         |



## **Pr2. ESTIMATING PRACTICE – II** **(Computer -Aided)**

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th
Total Period:	45	Examination	3 hrs
Practical periods:	3P/week	Sessional Examination:	25
Maximum marks:	75	Practical Examination	50

Detailed estimate from working drawings / standard drawings as mentioned at Sl. No. 1, 2 , 3 & 4 of theory – 4 Estimation & Cost Evaluation – II)are to be taken in the practical classes using excel sheets.(Computer aided).

<b>Learning Resources</b>			
<b>Text Books</b>			
<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	M.Chakraborty.	Estimating, Costing, specification & Valuation in Civil Engineering	Published by author
2	B.N.Dutta.	Estimating & Costing	UBSPD
3	Birdi & Ahuja.	Estimating & Costing	Dhanpat Rai Publications
4	Latest Orissa PWD Schedule of Rates & Analysis of rates		Govt. of Odisha

### Pr 3. PROJECT WORK (Phase-I)

Name of the Course: Diploma in Civil			
Course code:		Semester	5 <sup>th</sup>
Total Period:	60	Examination :	-
Theory periods:	4P / week	Sessional Marks	25
		TOTAL Marks	25

#### RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of civil engineering practices in real life situations, so as to participate and manage a large civil engineering projects in future.

Entire Project shall spread over 5<sup>th</sup> and 6<sup>th</sup> Semester. Part of the Project covered in 5<sup>th</sup> Semester shall be named as *Project Phase-I* and balance portion to be covered in 6<sup>th</sup> Semester shall be named as *Project Phase-II*.

#### OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop civil engineering knowledge and applications in implementing these for the actual needs of the community/industry.
- Explain the working of industrial environment and its work ethics.
- Explain what entrepreneurship is and how to become an entrepreneur.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- Field computing and to achieve real life experience in civil engineering planning, designing and execution.
- To develop the skill of writing Project Report

#### General Guidelines

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (right from beginning of 5<sup>th</sup> semester). Students should be allotted a problem of interest to him/her as a project work. It is also

essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 5 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

Following are the broad suggestive areas of project work

- ✓ Qualitative analysis of any one or more of the civil engineering materials by addition or alteration of one or more constituents to assess their suitability as construction materials.
- ✓ Characterization of one or more locally available/recently developed civil engineering materials
- ✓ Experimental investigation of behavior of structural elements.
- ✓ Preparation of innovative structural models by use of materials having close resemblance to real life structures.
- ✓ Qualitative and/or Quantitative analysis of Physio-chemical characteristics of water from one or more sources of water.
- ✓ Analysis, design and/or estimation of civil engineering structures. Use of software for execution of projects may be encouraged.
- ✓ Planning, testing and execution of construction project.
- ✓ Soil properties enhancement using different available materials.
- ✓ Development of Waste disposal system including e-waste.
- ✓ Application of different surveying techniques for solving real world problem.
- ✓ Traffic volume studies and congestion solution.
- ✓ Any other related area found worth.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	Performance Criteria
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

### **Project Phase-I and Phase-II**

The Project work duration shall cover 2 semesters(5<sup>th</sup> and 6<sup>th</sup> sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5<sup>th</sup> sem under Project Phase-I. The students may be allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work upto Design of the system have to be complete in Phase-I. Execution of work may begin in Phase-I depending on the Project. Project Milestones are to be set so that progress can be tracked . In Phase-II Execution of work and Documentation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-I in 5<sup>th</sup> semester there shall be one presentation by each group to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

**CIVIL ENGINEERING LABORATORY – II (FOR A GROUP OF 30 STUDENTS)**

Sl. No.	Name of the experiment	Name of apparatus required with detailed specification	Quantity required in No.
<b>Soil Testing Equipments</b>			
1	Determination of Water content of Soil by Oven drying method.	Metal Container or moisture can with lid(air tight non corrodible)suitable for 15 to 20g soil	5NOS
		Digital Weighing balance (0.01gm sensitivity) nearly 500gm capacity	2NOS
		Oven- Thermostatically controlled with interior of non–corroding material to maintain temperature at $110 \pm 5^{\circ}\text{C}$ .	1NO
		Descicators	1NO
		Tongs(One Pair)	5PAIRS
2	Determination of Specific gravity of Soil by Pycnometer/Density bottle.	Pycnometer	5NOS
		Density bottle	5NOS
		Vaccum descicators.	1NO
		Digital Weighing balance	2NOS
		Thermometer	1NO
		Glass rod	5NOS
		Sample divider of the multiple slot type (riffle box)	1 NO
3	Determination of Field Density of Soil by Core Cutter Method.	Cylindrical core cutter	4NOS
		Steel Rammer (with	4NOS
		Steel dolly	4NOS
		Digital Balance	2NOS
		Steel Rule.	4NOS
		Straight edge	4NOS
		Palette Knife	4NOS
4	Determination of Particle Size gradation of sand/Gravel by sieve analysis	(a) I.S.Sieves (GI, 450 mm dia.)- 100mm,75mm,40mm,25mm,19mm,12.5mm,10mm,6.5 mm, 4.75mm)	2 SETS
		(b) I.S.Sieves (Brass, 200mm dia)2.00mm,850 $\mu$ ,600 $\mu$ , 425 $\mu$ ,300 $\mu$ ,150 $\mu$ ,75 $\mu$ with lid and pan.	2 SETS
		Digital Weighing balance	2NOS
		Rubber pestle and motar	
		Mechanical Sieve Shaker	2 SETS
		Mechanical Sieve Shaker	2 SETS
5	Wet mechanical analysis using pipette method for clay and silt.	Pipete	4 NOS
		Cylinder/jars	5 NOS
		Mechanical stirrer	6 NOS
		Glass weighing bottles	7 NOS
		Digital Balance-	NIL
		Thermometer	1
		Water bath -	2NOS
6	Determination of	Casagrande's liquid limit device with grooving tools	5NOS

	Liquid Limit by soil by Casagrande's apparatus	Moisture can with lid	5NOS
		Porcelain evaporating dish	5NOS
		Spatula –flexible ,with the blade	5NOS
7	Determination of Plastic limit of soil.	Ground glass plate	4NOS
		3 mm dia glass rod	4NOS
		425 $\mu$ I.S. sieve	1NO
8	Determination of Shrinkage limit of soil.	Steel shrinkage dish –	8NOS
		Glass cup	4NOS
		Prong plate	4NOS
		Plain plate	4NOS
		Spatula	4NOS
		Straight edge	4NOS
		Mercurry	2 KG
		Porcelain evaporating dishes	4NOS
9	Determination of Coefficient of permeability of course grained soils under constant head method.	Permeameter mould of non-corrodible material	One set consist of all the above items
		Accassories of permeameter mould detachable collar ,porous stones (2 No.), dummy base plate etc.	
		Compaction rammer	
		Whatman Filter paper	
		Beaker	
		Drying crucible.	
		GI tray	
		Stop watch.	
		Glass Measuring cylinder	
		Reservoir/Over head tank	
10	Determination of MDD & OMC of soil by using modified Proctor Test	(a) Compaction moulds – cylindrical mould of capacity 1000 cc, internal diameter 100 mm ,effective height 127.3mm	One set consist of all the above items
		(b) Cylindrical mould of - 2250cc, internal diameter 150 mm, effective height 127.3mm	
		Metal rammers – (a) for light compaction (face diameter 50mm mass of 2.6 kg ,free drop of 310 mm) (b) for heavy compaction (mass =4.89kg ,free fall 450 mm )	
		Mould accessories – (detachable base plate , removable collar )	
		I.S. Sieves- size 19 mm & 4.75 mm, Brass	
		GI tray - 02 No.	
		Drying crucibles-06 Nos.	
		Graduated jars (Glass)	
		Straight edge	
		Spatula	
11	Determination of C and $\Phi$ of Soil sample by Triaxial Test device.	Tri-axial test cell	
		Lateral pressure assembly for applying and maintaining desired pressure on the fluid within the cell	
		Loading frame	
		Proving ring of	

		Split mould of diameter and length to suit the specimen	One set consist of all the above items
		Trimming knife	
		Scale & vernier calliperse.	
		Dial gauge	
		Piano wire saw	
		Metal straight edge	
		Volume change burette 25 cc.	
		Air compressor	
		Metal scale	
		Non-corrodible metal or plastic end caps of the same diameter as the specimen ; the upper cap having a central spherical seating to receive the loading ram	
		Seam less rubber membrane	
		Membrane stretcher	
		Rubber rings	
12	Determination of CBR value using Laboratory CBR Testing device	C.B.R mould	One set consist of all the above items
		Steel cutting edge (collar) which a can fit flush with the mould.	
		Spacer disc	
		Surcharge weight	
		Dial gauge	
		Penetration plunger	
		Loading machine	
		Metal rammer	
		Expansion measuring apparatus – perforated plate with adjustable stem, metal tripod etc.	
Hydraulics Laboratory			
1	Verification of Bernoulli's Theorem	F1-10 hydraulics bench	One set consist of all the above items
		F1-15 Bernoulli's apparatus test equipment	
		A stopwatch for timing the flow measurement.	
2	Determination of coefficient of Discharge of a rectangular notch fitted in open Channel	Rectangular notch, Collecting tank, Constant head tank, Stop watch	One set consist of all the above items
3	Determination of coefficient of Discharge of a Venturimeter, Orificemeter fitted in a pipe	Venturimeter fitted in a horizontal pipe line with means of varying flow rate, U tube differential manometer.	Each One set consist of all the above items
		Orificemeter fitted in a horizontal pipeline with means of varying flow rate, U tube differential manometer.	

4	Determination of head Loss due to friction and coefficient of friction for flow through pipe	F1-10 hydraulics bench	One set consist of all the above items
		F1-18 pipe friction apparatus	
		Stopwatch for timing the flow measurement	
		Measuring cylinder for measuring very low flow rates	
		Spirit level	
		Thermometer	
Transportation Laboratory			
1	Penetration Test of Bitumen	<b>Penetrometer</b> consisting of a needle assembly with a total weight of 100 gram and device for releasing and locking needle in any position.	One set consist of all the above items
2	Ductility Test of Bitumen	<b>Briquette mould:</b> It is made of brass. Circular holes are provided at ends called clips to grip the fixed and movable ends of the testing machine.	One set consist of all the above items
		<b>Water bath:</b> A bath maintained within 27.0° ±0.1 °C of the specified test temperature containing not less than 10 litres of water.	
		<b>Testing machine:</b> For pulling the briquette of bituminous material apart, any apparatus may be used which is so constructed that the specimen will be continuously submerged in water while the two clips are being pulled apart horizontally at a uniform speed of 50 ± 2.5 mm per minute.	
		<b>Thermometer:</b> Range 0-44°C and readable up to 0.2°C	
3	Viscosity Test of Bitumen	Tar viscometer, cup, valve, receiver, thermometer	One set consist of all the above items
4	Bitumen content by centrifuge extractor	Centrifuge apparatus used for binder content test of bituminous mix	One set consist of all the above items
Public Health Engineering Laboratory			
1	Determination of Turbidity of water Sample using Turbidimeter/Nephelometer/Jackson's Candle Turbidimeter	W.H.O Nephelometric turbidity meter and test tubes	One set consist of all the above items



2	Determination of pH of Water sample using (a) pH – meter (b) colour Comparator	pH meter with electrode, Color comparator with discs	One set consist of all the above items
		Thermometer that can read $77\pm 18^{\circ}\text{C}$ to the nearest value of 0.1 degree Celsius	
		Glass stirring rod	
		Minimum capacity scale to read up to 1.1 lb	
3	Determination of Chloride content of a Water sample using method of titration	Burette Pipettes Flask Measuring Cylinder	One set consist of all the above items
4	Determination of Coagulant (Alum) dose requirement for a turbid water sample by Jar Test.	Jar test apparatus Glass beaker Pipette pH meter Nephelometer	One set consist of all the above items
5	Determination of dissolved oxygen in a water sample	300 ml capacity bottle with stopper Burette Pipette	One set consist of all the above items
6	Determination of B.O.D of waste water sample by Coliform test	B.O.D. bottle 300ml capacity B.O.D. incubator Air compressor Measuring cylinder Burette pipette	One set consist of all the above items

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 6th Semester (Civil Engineering)(wef 2020-21)									
Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Land Survey-II	5		-	20	80	3	100
Th.2		Construction Management	4		-	20	80	3	100
Th.3		Advanced Construction Techniques & Equipment	4		-	20	80	3	100
Th.4		Electives: a. Concrete Technology, b. Disaster Management c. Architectural Practices & Interior Design	4			20	80	3	100
		<i>Total</i>	17			80	320	-	400
		<b>Practical</b>							
Pr.1		Construction Workshop Practice & MS Project	-	-	5	25	25		50
Pr.2		Land Survey Practice -II	-	-	5	25	50		75
Pr.3		CADD Lab and Design & Detailing Practice	-	-	3	25	25		50
Pr.4		Project Phase-II			5	50	100		150
Pr.5		Life Skill			2	25	-		25
		Student Centred Activities(SCA)		-	2	-	-	-	-
		<i>Total</i>	-	-	22	150	200	-	350
		<b>Grand Total</b>	<b>17</b>		<b>22</b>	<b>230</b>	<b>520</b>	<b>-</b>	<b>750</b>

Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

**Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%**

**SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM/ Idea Tinkering and Innovation Lab Practice etc. ,Seminar and SCA shall be conducted in a section.**

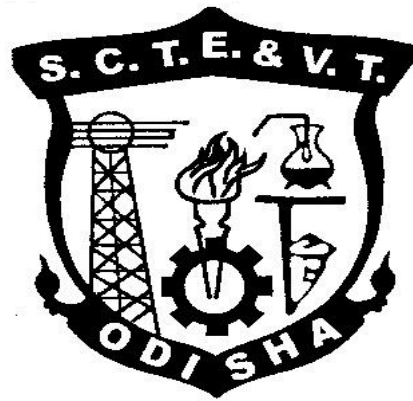
**There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester**

# **CURRICULLUM OF 6<sup>TH</sup> SEMESTER**

**For**

**DIPLOMA IN CIVIL ENGINEERING**

**(Effective FROM 2020-21 Sessions)**



**STATE COUNCIL FOR TECHNICAL EDUCATION  
& VOCATIONAL TRAINING, ODISHA,  
BHUBANESWAR**

## Th 1. LAND SURVEY– II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	75	Examination	3 hrs
Theory periods:	5P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

Modern survey techniques are heavily dependent on advanced instruments and image based data. The course enables students to acquaint themselves with necessary information and processing procedures.

### B. COURSE OBJECTIVES

On completion of the subject a student will be able to –

1. Solve numerical problems in the segment off tacheometry
2. Comprehend concepts of curve ranging and solve simple numerical
3. Study and interpret maps
4. Acquaint themselves with modern surveying methods including use of digital theodolite and total station
5. Comprehend basics of GPS setup, data processing and export
6. Comprehend basics of GIS and prepare map using GIS data

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	TACHEOMETRY: (Only concepts; applications without derivation)	09
2	CURVES	08
3	BASICS ON SCALE AND BASICS OF MAP:	08
4	SURVEY OF INDIA MAP SERIES:	10
5	BASICS OF AERIAL PHOTOGRAPHY, PHOTOGRAMMETRY, DEM AND ORTHO IMAGE GENERATION:	10
6	MODERN SURVEYING METHODS :	10
7	BASICS ON GPS & DGPS AND ETS:	10
8	BASICS OF GIS AND MAP PREPARATION USING GIS	10

### D. COURSE CONTENTS:

- 1 **TACHEOMETRY:**  
**(Only concepts; applications without derivation)**
  - 1.1 Principles, stadia constants determination
  - 1.2 Stadia tacheometry with staff held vertical and with line of collimation horizontal or inclined, numerical problems
  - 1.3 Elevations and distances of staff stations – numerical problems
- 2 **CURVES :**
  - 2.1 compound, reverse and transition curve, Purpose & use of different types of curves in field

- 2.2 Elements of circular curves, numerical problems
- 2.3 Preparation of curve table for setting out
- 2.4 Setting out of circular curve by chain and tape and by instrument angular methods (i) offsets from long chord, (ii) successive bisection of arc, (iii) offsets from tangents, (iv) offsets from chord produced, (v) Rankine's method of tangent angles (No derivation)
- 2.5 Obstacles in curve ranging – point of intersection inaccessible

### **3 BASICS ON SCALE AND BASICS OF MAP:**

- 3.1 Fractional or Ratio Scale, Linear Scale, Graphical Scale
- 3.2 What is Map, Map Scale and Map Projections
- 3.3 How Maps Convey Location and Extent
- 3.4 How Maps Convey characteristics of features
- 3.5 How Maps Convey Spatial Relationship
- 3.5.1 Classification of Maps
  - 3.5.1 Physical Map
  - 3.5.2 Topographic Map
  - 3.5.3 Road Map
  - 3.5.4 Political Map
  - 3.5.5 Economic & Resources Map
  - 3.5.6 Thematic Map
  - 3.5.7 Climate Map

### **4 SURVEY OF INDIA MAP SERIES:**

- 4.1 Open Series map
- 4.2 Defense Series Map
- 4.3 Map Nomenclature
  - 4.3.1 Quadrangle Name
  - 4.3.2 Latitude, Longitude, UTM's
  - 4.3.4 Contour Lines
  - 4.3.5 Magnetic Declination
  - 4.3.6 Public Land Survey System
  - 4.3.7 Field Notes

### **5 BASICS OF AERIAL PHOTOGRAPHY, PHOTOGRAMMETRY, DEM AND ORTHO IMAGE GENERATION:**

- 5.1 Aerial Photography:
  - 5.1.1 Film, Focal Length, Scale
  - 5.1.2 Types of Aerial Photographs (Oblique, Straight)
- 5.2 Photogrammetry:
  - 5.2.1 Classification of Photogrammetry
  - 5.2.2 Aerial Photogrammetry
  - 5.2.3 Terrestrial Photogrammetry
- 5.3 Photogrammetry Process:
  - 5.3.1 Acquisition of Imagery using aerial and satellite platform
  - 5.3.2 Control Survey
  - 5.3.3 Geometric Distortion in Imagery
    - Application of Imagery and its support data
    - Orientation and Triangulation
    - Stereoscopic Measurement
      - 19.9.1 X-parallax
      - 19.2.2 Y-parallax

- 5.4 DTM/DEM Generation
- 5.5 Ortho Image Generation

**6 MODERN SURVEYING METHODS :**

- 6.1 Principles, features and use of (i) Micro-optic theodolite, digital theodolite
- 6.2 Working principles of a Total Station (Set up and use of total station to measure angles, distances of points under survey from total station and the co-ordinates (X,Y & Z or northing, easting, and elevation) of surveyed points relative to Total Station position using trigonometry and triangulation.

**7 BASICS ON GPS & DGPS AND ETS:**

- 7.1 GPS: - Global Positioning
  - 7.1.1 Working Principle of GPS,GPS Signals,
  - 7.1.2 Errors of GPS,Positioning Methods
- 7.2 DGPS: - Differential Global Positioning System
  - 7.2.1 Base Station Setup
  - 7.2.2 Rover GPS Set up
  - 7.2.3 Download, Post-Process and Export GPS data
  - 7.2.4 Sequence to download GPS data from flashcards
  - 7.2.5 Sequence to Post-Process GPS data
  - 7.2.6 Sequence to export post process GPS data
  - 7.2.7 Sequence to export GPS Time tags to file
- 7.3 ETS: - Electronic Total Station
  - 7.3.1 Distance Measurement
  - 7.3.2 Angle Measurement
  - 7.3.3 Leveling
  - 7.3.4 Determining position
  - 7.3.5 Reference networks
  - 7.3.6 Errors and Accuracy

**8 BASICS OF GIS AND MAP PREPARATION USING GIS**

- 8.1 Components of GIS, Integration of Spatial and Attribute Information
- 8.2 Three Views of Information System
  - 8.2.1 Database or Table View, Map View and Model View
- 8.3 Spatial Data Model
- 8.4 Attribute Data Management and Metadata Concept
- 8.5 Prepare data and adding to Arc Map.
- 8.6 Organizing data as layers.
- 8.7 Editing the layers.
- 8.8 Switching to Layout View.
- 8.9 Change page orientation.
- 8.10 Removing Borders.
- 8.11 Adding and editing map information.
- 8.12 Finalize the map

**E. COURSE COVERAGE UPTO INTERNAL ASSESSMENT**

Chapters 1, 2, 3, 4, 5

## F. RECOMMENDED BOOKS

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	D. Gaikwad	Advanced Surveying	S.Chand
2	B. C. Punmia	Surveying Vol. I, II, III	Laxmi Publication, Delhi – 06
3	R. Agor	A text book of surveying and leveling	Khanna Publishers, Delhi-6
4	N. N. Basak	Surveying and Levelling	Tata Mcgraw Hill

## REFERENCE Materials

1. <https://theconstructor.org/surveying/surveying-principles-methods-civil-engineering/13048/>
2. <https://www.novatel.com/an-introduction-to-gnss/chapter-2-basic-gnss-concepts/>
3. [http://gps.alaska.edu/jeff/Spatial\\_Reference/Freymueller\\_DOT\\_GPS.pdf](http://gps.alaska.edu/jeff/Spatial_Reference/Freymueller_DOT_GPS.pdf)
4. <https://drive.google.com/file/d/0B7srsI9Fr4QdUzAzSlRwZnNRZ3M/view:->
5. [Surveying and Levelling by N.N. Basak, 2nd Edition](#)
6. [https://2018.foss4g-na.org/sites/default/files/slides/survey\\_resurvey\\_cadastral\\_layer\\_Odisha.pdf](#)
7. <http://www.lawsfindia.org/pdf/orissa/2012/2012OR5.pdf>
8. [http://revenueodisha.gov.in/sites/default/files/document/DILRMP/SOP\\_MRR\\_2016.pdf](http://revenueodisha.gov.in/sites/default/files/document/DILRMP/SOP_MRR_2016.pdf)
9. [http://revenueodisha.gov.in/sites/default/files/document/Govt\\_Land/22958\\_4\\_8\\_14.pdf](http://revenueodisha.gov.in/sites/default/files/document/Govt_Land/22958_4_8_14.pdf)
10. <https://www.google.co.in/search?q=map+reading+and+interpretation+ppt&oq=Map+reading+and+&aqs=chrome.3.69i57j0l5.9755j0j7&sourceid=chrome&ie=UTF-8>
11. Map Use: Reading, Analysis and Interpretation by Juliana O. Muehrcke and Philip Muehrcke
12. <http://indiageospatialforum.org/2012/proceedings/ppt/P%20K%20parida.pdf>
13. <http://www.indiana.edu/~paleoind/Resources/Guide%20to%20Topographic%20Maps.pdf>
14. <http://www.dst.gov.in/sites/default/files/nationalmappolicy.pdf>
15. Remote sensing and GIS / BasudebBhatta, 2<sup>nd</sup> edition, New Delhi, India, Oxford University Press, - Oxford higher education.
16. [http://www.gisresources.com/basic-of-photogrammetry\\_2/](http://www.gisresources.com/basic-of-photogrammetry_2/)
17. [http://giswin.geo.tsukuba.ac.jp/sis/tutorial/Fundamentals of GIS Estoque.pdf](http://giswin.geo.tsukuba.ac.jp/sis/tutorial/Fundamentals_of_GIS_Estoque.pdf)
18. [Learning Material Approved by R&DM Deptt., Govt. of Odisha](#)

## Th 2. CONSTRUCTION MANAGEMENT

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

The course aims to prepare students to be an effective team member in a construction organization setup. This necessitates managerial skills in managing materials, time and human resources. Also, the course helps the students to build concepts of disasters and explore about manmade disasters at national as well as international level with quality measuring indices and vulnerability atlas of India.. The course has been designed to cater to these needs.

### B. COURSE OBJECTIVES

On completion of the course students will be able to-

1. Develop schedules for construction project
2. Realize significance of organizational behavior towards successful functioning
3. Explain the important terminology related to materials management, site management, equipment management and labor management
4. Understand construction quality indicators and their measurement
5. Apply methods to measure and monitor progress of work
6. Realize significance of safety requirement and regulations at workplace
7. Understand the importance and usage of the Vulnerability Atlas of India in construction Projects.

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Introduction To Construction Management	04
2	Constructional Planning	07
3	Materials and Stores Management	04
4	Construction Site Management	05
5	Construction Organisation:	06
6	Construction Labour and Labour Management:	06
7	Equipment Management	06
8	Quality Control	05
9	Monitoring Progress	06
10	Safety Management In Construction	05
11	Role of Vulnerability Atlas of India in construction projects	06

### D. COURSE CONTENTS:

- 1 **Introduction To Construction Management**
  - 1.1 Aims and objectives of construction management.
  - 1.2 Functions of construction management.
  - 1.3 The construction team components- owner,engineer,architect,contractor-their functions and interrelationship and jurisdiction.
  - 1.4 Resources for construction management-men,machines,materials,money



- 2**        **Constructional Planning**
  - 2.1    Importance of Construction Planning
  - 2.2    Developing work breakdown structure for construction work
  - 2.3    Construction Planning stages-Pre-tender stage, Post-tender stage.
  - 2.4    Construction scheduling by Bar charts-preparation of Bar Charts for simple construction works.
  - 2.5    Preparation of schedules for labour materials,machinery, finance for small works
  - 2.6    Limitation of Bar charts
  - 2.7    Construction scheduling by network techniques-defination of terms ,PERT and CPM techniques, advantages and disadvantages of two techniques, network analysis, estimation of time and critical path, application of PERT and CPM techniques in sample construction works.
- 3**        **Materials and Stores Management**
  - 3.1    Classification of Stores-storage of stock.
  - 3.2    Issue of materials-indent , invoice, bin card
- 4**        **Construction Site Management**
  - 4.1    Job Lay out-Objectives, Review plans, specifications, Lay out of equipments.
  - 4.2    Location of equipment, organizing labour at site.
  - 4.3    Job lay out for different construction sites.
  - 4.4    Principle of storing material at site.
- 5**        **Construction Organization:**
  - 5.1    Introduction – Characteristics, Structure, importance.
  - 5.2    Organization types-line and staff, functions and their characteristics
  - 5.3    Principles of organization- meaning and significance of terms- control, authority, responsibility, job & task.
  - 5.4    Leadership-necessity, styles of leadership, role of leader
  - 5.5    Human relations-relations with subordinates, peers, Supervisors, characteristics of group behavior, mob psychology, handling of grievances, absenteeism, labour welfare.
  - 5.6    Conflicts in organization-genesis of conflicts, types-intrapersonal, interpersonal, intergroup, resolving conflicts.
- 6**        **Construction Labour and Labour Management:**
  - 6.1    Preparing Labour schedule
  - 6.2    Essential steps for optimum labour output
  - 6.3    Labour characteristics
  - 6.4    Wages & their payment
  - 6.5    Labour incentives
  - 6.6    Motivation- Classification of motives, different approaches to motivation.
- 7**        **Equipment Management**
  - 7.1    Preparing the equipment schedule
  - 7.2    Identification of different alternative equipment
  - 7.3    Importance of Owning & operating costs in making decisions for hiring & purchase of equipment
  - 7.4    Inspection and testing of equipment
  - 7.5    Equipment maintenance
- 8**        **Quality Control**
  - 8.1    Concept of quality in construction
  - 8.2    Quality Standards- during construction, after construction, destructive & non destructive methods.

- 9 Monitoring Progress**
- 9.1 Programme and progress of work
  - 9.2 Work study
  - 9.3 Analysis and control of physical and financial progress corrective measures.
- 10 Safety Management In Construction**
- 10.1 Importance of safety
  - 10.2 causes and effects of accidents in construction works
  - 10.3 Safety measures in worksites for excavation, scaffolding, formwork, fabrication and erection, demolition.
  - 10.4 Development of safety consciousness
  - 10.5 Safety legislation- Workman's compensation act, contract labour act.
- 11 Role of Vulnerability Atlas of India in construction projects**
- 11.1 Introduction to Vulnerability Atlas of India, Concepts of natural hazards and disasters and vulnerability profile of India. Definition of disaster related terms.
  - 11.2 Earthquake hazard and vulnerability, Magnitude and intensity scales of earthquake, seismic zones, earthquake hazard maps, types of structures and damage classification, effects in housing and resistant measures.
  - 11.3 Wind / Cyclone hazard and vulnerability, wind speed and pressures, wind hazard and cyclone occurrence maps, storm surveys and cyclone resistant measures.
  - 11.4 Flood hazard and vulnerability, Flood hazard and Flood prone areas of the country, General protection of habitants and flood resistant construction.
  - 11.5 Landslides, Tsunamis and Thunderstorm hazards and vulnerability, Landslide & Thunderstorm incidence maps, Measures against Tsunami hazards.
  - 11.6 Housing vulnerability risk tables and usage of vulnerability atlas of India, Inclusion of vulnerability atlas in Tender documents.

## **E. COURSE COVERAGE UPTO INTERNAL ASSESSMENT**

Chapters 1, 2, 3, 4, 5

## **F. RECOMMENDED BOOKS**

<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	M. R. Samal & R.L. Sahoo	Construction Management	Kalyani Publication
2	PS Gahlot & B M Dhir	Construction planning and management	New age international Publishers
3	Robert L Peurifoy & William B Ledbetter	Construction Planning equipment and methods	TMH Education
4	Dr. U K Shrivastava	Construction planning and management	Galgotia Publications
5	SC Sharma	Construction equipment and its management	Khanna Publishers
6	B Sengupta & H Guha	Construction management and planning	TMH Education
7	Vulnerability Atlas of India:- Published By BMTPC of India		

## Th 3. ADVANCED CONSTRUCTION TECHNIQUES & EQUIPMENT

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

Current age construction industry is adopting state of art materials and technologies to improve aesthetics, strength, earthquake resistance, services relating to civil construction. The course will help the student to develop a general awareness on these advancements.

### B. COURSE OBJECTIVES

On completion of the course students will be able to-

1. Select proper material during construction in domain of advanced materials including fibers, artificial timbers etc.
2. Select appropriate prefabrications in pursuance of standard codes
3. Adopt structural requirements and possible retrofits to improve earthquake resistance
4. Comprehend requirement of various services need to be operational
5. Understand the role of different construction earth moving equipments and select during planning
6. Comprehend necessity of soil reinforcing and prescribe appropriate strategy

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Advanced construction materials	10
2	Prefabrication	08
3	Earthquake Resistant Construction	08
4	Retrofitting of Structures	08
5	Building Services	08
6	Construction and earth moving equipments	10
7	Soil reinforcing techniques	08

### D. COURSE CONTENT

#### 1 Advanced construction materials

##### 1.1 Fibers and Plastics-

Types of fibers- Steel, Carbon, glass fibers, Use of fibers as construction material, properties of Fibers.

Types of plastics- PVC, RPVC, HDPE, FRP, GRP etc. Colored plastic sheets.

Use of plastic as construction material.

- 1.2 Artificial Timbers – Properties and uses of artificial timber. Types of artificial timber available in market, strength of artificial timber.
- 1.3 Miscellaneous materials – Properties and uses of acoustics materials, wall claddings, plaster boards, micro-silica, artificial sand, bonding agents, adhesives etc.

## **2 Prefabrication**

- 2.1 Introduction, necessity and scope of prefabrication of buildings, history of prefabrication, current uses of prefabrication , types of prefabricated systems, classification of prefabrication, advantages and disadvantages of prefabrication,
- 2.2 The theory and process of prefabrication, design principle of prefabricated systems, types of prefabricated elements, modular coordination
- 2.3 Indian standard recommendation for modular planning.

## **3 Earthquake Resistant Construction**

- 3.1 Building Configuration
- 3.2 Lateral Load resisting structures
- 3.3 Building characteristics
- 3.4 Effect of structural irregularities-vertical irregularities, plan configuration problems.
- 3.5 Safety consideration during additional construction and alteration of existing Buildings.
- 3.6 Additional strengthening measures in masonry building-corner reinforcement, lintel band, sill band, plinth band, roof band, gable band etc.

## **4 Retrofitting of Structures**

- 4.1 Seismic retrofitting of reinforced concrete buildings :
- 4.2 -Sources of weakness in RC frame building
- 4.3 -Classification of retrofitting techniques and their uses

## **5 Building Services**

- 5.1 Cold Water Distribution in high rise building, lay out of installation
- 5.2 Hot water supply – General principles for central plants-layout

- 5.3 Sanitation –soil and waste water installation in high rise buildings
- 5.4 Electrical services – i) requirements in high rise buildings ii) Layout of wiring - types of wiring iii) Fuses and their types iv)Earthing and their uses
- 5.5 Lighting – Requirement of lighting, Measurement of light intensity
- 5.6 Ventilation - Methods of ventilation (Natural and artificial Systems of ventilation) problems on ventilation
- 5.7 Mechanical Services- Lifts, Escalator, Elevators – types and uses.

## **6 Construction and earth moving equipments –**

- 6.1 Planning and selection of construction equipments
- 6.2 Study on earth moving equipments like drag line, tractor, bulldozer, Power shovel
- 6.3 Study and uses of compacting equipments like tamping rollers, Smooth wheel rollers, Pneumatic tired rollers and vibrating compactors
- 6.4 Owning and operating cost – problems

## **7 Soil reinforcing techniques**

- 7.1 Necessity of soil reinforcing.
- 7.2 Use wire mesh and geo-synthetics.
- 7.3 Strengthening of embankments, Slope stabilization in cutting and embankments by soil reinforcing techniques.

**E. Syllabus Coverage up to Internal Assessment:** Chapters 1, 2, 3, 4

## **F. RECOMMENDED BOOKS**

<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	Agrawal & Shrikhande	Earthquake Resistant Design of Structures	Prentice-Hall of India Pvt. Ltd.
2	Swami Saran	Reinforced Soil and its Engineering applications	I.K.International Pvt. Ltd.
3	National building code of India_ BIS		
4	Fred & Greeno	Building Services Hand book	Routledge Publisher
5	B.L. Gupta & Amit Gupta	Construction Management & Machinery Limit	Standard Publishers
6	S.K. Duggal,	Earthquake resistant design of structures	Oxford
7	M.R. Samal	Advance Construction and Equipment	Platinum Publisher, Kolkata
8	Hand book on repair & rehabilitation of RCC buildings- CPWD		

## Th 4(a). CONCRETE TECHNOLOGY (ELECTIVE )

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

Concrete is said to be the second most consumed material and in construction plays a vital role. The knowledge in constituents, strength development process and deterioration mechanism helps the learner in designing and producing good quality concrete.

### B. COURSE OBJECTIVES

On completion of the course, the students will be able to

1. Describe functions and characteristics of the concrete constituents
2. Prescribe test requirements and methods for fresh and hardened concrete
3. Design concrete mix
4. Comprehend concrete production and inspection techniques
5. Acquaint themselves with special concrete preparation and application
6. Know the concrete deteriorating agencies and methods towards durability improvement and repair

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Concrete as a construction material	02
2	Cement	04
3	Aggregate, Water and Admixtures:	06
4	Properties of fresh concrete	06
5	Properties of hardened concrete	07
6	Concrete mix Design	05
7	Production of concrete	06
10	Inspection and Quality Control of Concrete	06
11	Special Concrete	06
12	Deterioration of concrete and its prevention:	06
13	Repair technology for concrete structures:	06

### D. COURSE CONTENTS:

#### 1 Concrete as a construction material:

- 1.1 Grades of concrete.
- 1.2 Advantages and disadvantages of concrete.

#### 2 Cement:

- 2.1 Composition, hydration of cement, water cement ratio and compressive strength, fineness of cement, setting time, soundness, types of cement.

#### 3 Aggregate, Water and Admixtures:

- 3.1 Classification and characteristics of aggregate, fineness modulus, grading of aggregate, I.S.383
- 3.2 Quality of water for mixing and curing.
- 3.3 Important functions, classification of admixtures, I.S 9103, accelerating admixtures, retarding admixtures, water reducing admixtures, air containing admixtures

**4 Properties of fresh concrete:**

4.1 Concept of fresh concrete, workability, slump test, compacting factor test, V-bee consistency test and flow test, requirement of workability, I.S. 1199.

**5 Properties of hardened concrete:**

5.1 Cube and cylinder compressive strengths, flexural strength of concrete, stress-strain and elasticity, phenomena of creep and shrinkage, permeability, durability of concrete, sulphate, chloride and acid attack on concrete, efflorescence.

**6 Concrete mix Design**

6.1 a) Introduction

b) Data or input required for mix design.

6.2 Nominal mix concrete & design mix concrete.

6.3 Basic consideration for concrete mix design, Methods of proportioning concrete mix – I.S. Code method of mix design (I.S. 10262)

**7 Production of concrete:**

7.1 Batching of materials, mixing of concrete materials, transportation, placing of concrete, compaction of concrete (vibrators), Curing of concrete, Formwork-requirements and types, stripping of forms. (Concepts only)

**10 Inspection and Quality Control of Concrete**

10.1 Quality control of Concrete as per I.S. 456, Factors causing the variations in the quality of concrete

10.2 Mixing, Transporting, Placing & curing requirements of Concrete as per I.S. 456.

10.3 Inspection and Testing as per Clause 17 of IS: 456.

10.4 Durability requirements of Concrete as per I.S. 456.

**11 Special Concrete**

11.1 Introduction to ready mix concrete, high performance concrete, silica fume concrete, shotcrete concrete or gunniting (Concepts only).

**12 Deterioration of concrete and its prevention:**

12.1 Types of deterioration, prevention of concrete deterioration, corrosion of reinforcement, effects and prevention

**13 Repair technology for concrete structures:**

13.1 Symptom, cause and prevention and remedy of defects during construction, cracking of concrete due to different reasons. Repair of cracks for different purposes, selection of techniques, polymer based repairs, common types of repairs.

**E. COURSE COVERAGE UPTO INTERNAL ASSESSMENT**

Chapters 1,2,3,4,5,6

**F. RECOMMENDED BOOKS**

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	M.S Shetty & A.K.Jain	Concrete technology	S.Chand
2	M.L.Gambhir	Concrete technology	Tata McGraw Hill.
3	A R Santhakumar.	Concrete technology	Oxford Publication
<b>CODE</b>			
4	BIS Codes:- I.S 383,10262,9103		

## Th 4(b). DISASTER MANAGEMENT (ELECTIVE )

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

The course helps students to build concepts of disasters and explore into the strategies and existing policies to mitigate challenges imposed by the natural and manmade disasters at national as well as international level.

### B. COURSE OBJECTIVES

On completion of the course students will be able to

1. Comprehend the risk and social vulnerability in wake of disasters
2. Define the disasters and comprehend the scales of measuring the intensities associated
3. State the causes and basic science behind the disasters
4. Prescribe mitigating strategies
5. Prepare for possible effects in industry and society
6. Follow appropriate plans and policies formulated by government institutions and policy planning body
7. Develop awareness about application of remote sensing in Disaster Risk Management (DRM)

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Introduction	04
2	Earthquakes	06
3	Tsunami	05
4	Landslides.	05
5	Cyclones	06
6	Floods	06
7	Droughts	05
8	Forest Fire	05
9	Other type of Hazards and disasters	05
10	Policy, Planning and Institutions for disaster mitigation	05
11	Geospatial Application for Disaster Risk Management at Global and Local level	08

### D. COURSE CONTENTS

#### 1 Introduction

- 1.1 Definition of hazards, disasters. Explain the difference between hazard and disaster.
- 1.2 Concept of risk and vulnerability. Risk reduction: preparedness and mitigation.
- 1.3 Disaster management cycle.



- 1.4 Personal and community awareness.
- 1.5 Types of disasters, earthquake, Tsunami, Landslide, cyclone, flood, drought, forest fire, Chemical and industrial accidents.

## **2 Earthquakes.**

- 2.1 Definition and concept, intensity, Richter's scale.
- 2.2 Element of risk.
- 2.3 Hazard Zones in India.
- 2.4 Typical effects.
- 2.5 Main mitigation strategies, safe Engineering practice, Indian Standard code and enforcement Bye-Laws.

## **3 Tsunami.**

- 3.1 Definition and concept.
- 3.2 Onset, Type and Cases.
- 3.3 Warming.
- 3.4 Elements at risk.
- 3.5 Typical effects, Physical damage, Environmental Damage, Casualties and Public health.
- 3.6 Specific Preparedness: Hazard Mapping, Early warning systems, Community preparedness.
- 3.7 Main mitigation strategies: Site planning and land management, Engineering structures. Flood management.

## **4 Landslides.**

- 4.1 Definition, concept.
- 4.2 Onset time and warning.
- 4.3 Causes.
- 4.4 Elements at risk.
- 4.5 Hazard zones and Indian landslides.
- 4.6 Typical effects: Physical damage, casualties.
- 4.7 Main mitigation strategies: Hazard mapping, Landslide practice, retaining walls, Surface drainage control works, Engineering structures.
- 4.8 Community based mitigation.

## **5 Cyclones.**

- 5.1 Definition, concept.
- 5.2 Onset type, Warning.
- 5.3 Elements at risk.
- 5.4 Typical effects.
- 5.5 Indian Hazard Zones.
- 5.6 Main mitigation strategies: Hazard mapping, Land use control, Engineering Structures, Flood management, improving vegetation cover.

5.7 Community based mitigation.

**6 Floods.**

6.1 Definition, concept, Onset type.

6.2 Warning.

6.3 Elements at risk.

6.4 Hazard zones and Indian floods.

6.5 Typical effects: Physical damage, Casualties and Public health, Crops and flood.

6.6 Main mitigation strategies: Mapping of the flood prone areas, land use control, Flood control and management.

6.7 Community based mitigation.

**7 Droughts.**

7.1 Definition, concept.

7.2 Onset type and warning.

7.3 Elements at risk.

7.4 Typical effects.

7.5 Main mitigation strategies: drought monitoring, water supply augmentation and conservation.

7.6 Drought Planning.

**8 Forest Fire.**

8.1 Definition and concept.

8.2 Forest fire damages in India.

8.3 Operational fire management systems and organizations.

8.4 Community involvement.

8.5 Public policies concerning fire.

8.6 The needs of fire management.

**9 Other type of Hazards and disasters.**

9.1 Chemical and Industrial disasters: brief description, effects, Preparedness.

9.2 Epidemic: Onset type, warning, causes and effects, risk reduction measures.

9.3 Heat waves: definition, dangers and effects, Forecasts and warning, awareness.

**10 Policy, Planning and Institutions for disaster mitigation.**

10.1 Role of policy makers in disaster risk reduction, course for specific action.

10.2 Institutional arrangement in India: Central level, State Level, District and Block level.

10.3 Major institutions in National and State level.

- 11 Geospatial Application for Disaster Risk Management at Global and Local level**
- 11.1 Overview of Disaster Risk Management (DRM) and relevance of geospatial technologies in DRM
  - 11.2 Earth observation technologies and their application in disaster management.
  - 11.3 Remote sensing and geospatial intelligence for disaster management.
  - 11.4 Application of remote sensing in hydro metrological, geological and environmental disaster.
  - 11.5 International systems for disaster risk management:- UN-SPIDER, International Charter for Space and Major Disasters, Copernicus Emergency Management Service & Sentinel Missions.

#### **E. COURSE COVERAGE UPTO INTERNAL ASSESSMENT**

Chapters 1, 2, 3, 4, 5

#### **F. RECOMMENDED BOOKS**

<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
<b>1</b>	R. Subramanian	Disaster Management	Vikas Publication
<b>2</b>	Donald and David Hyndman	Natural hazards and Disasters	Books/Cole CENGAGE learning
<b>3</b>	D.K.Sinha	Towards Basics of Natural Disaster	Researchco Book Centre
<b>4</b>	S.B.Reed	Introduction to Hazards	Disaster Management Training Programme, 1997
<b>5</b>	Nigel Blundell	A Century of Man -Made Disaster	Pen & Sword Books Limited
<b>6</b>	<b>Website of “United Nation office for Outerspace Affairs” &amp; “charter space &amp; measure disasters”</b> <a href="http://www.unoosa.org">www.unoosa.org</a> <a href="http://www.disasterscharter.org">www.disasterscharter.org</a> <a href="http://www.un-spider.org">www.un-spider.org</a>		

## Th 4(c). ARCHITECTURAL PRACTICES AND INTERIOR DESIGN (Elective)

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Maximum marks:	100	End Semester Examination:	80

### A. RATIONALE

The course helps students comprehend the important roles architects play in providing aesthetics and utility simultaneously. The course further exposes students to undertake designing activities considering anthropomorphic requirement and engineering challenges.

### B. COURSE OBJECTIVES

On completion of the course students will be able to-

1. Comprehend the role of architects in taking care of utility and aesthetics
2. Analyze case study relating to residential and commercial buildings
3. Understand and apply procedure of landscaping
4. Comprehend ergonomic requirement and adopt in the building and its components
5. Comprehend the characteristics of interior materials and prescribe accordingly
6. Formulate plans for residential and small commercial buildings in compliance of requirements

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Architectural design	06
2	Building Aesthetics	06
3	Design of Projects	07
4	Landscaping	07
5	Elements & principle of Interior Design	07
6	Anthropometrics Data	06
7	Interior materials	07
8	Interior of Residential Building	07
9	Interior of small commercial building	07

### D. COURSE CONTENTS:

#### 1 Architectural design.

- 1.1 Review of Architecture
- 1.2 Site selection, climatic conditions, sun control, orientation of building & site
- 1.3 Building bye laws and its applications.

## **2 Building Aesthetics**

- 2.1 Feeling for aesthetics and utility, composition, utility, mass composition, order, expression,
- 2.2 Proportion, scale, accentuation, order, expression, proportion, scale, accentuation & rhythm, contrast, balance, pattern.
- 2.3 Character of building.

## **3 Design of Projects**

- 3.1 A case study of residential building.
- 3.2 A case study of public / commercial building.
- 3.3 Aspect of working Drawing – Plan, Elevation and Section.

## **4 Landscaping**

- 4.1 Soft and hard landscaping
- 4.2 Basic principles of landscaping.
- 4.3 Assessment of land.
- 4.4 Design procedure.
- 4.5 A case study of landscaping for public / commercial building campus.
- 4.6 Main mitigation strategies: Hazard mapping, Landslide practice, retaining walls, Surface drainage control works, Engineering structures.
- 4.7 Community based mitigation.

## **5 Elements & principle of Interior Design**

- 5.1 Elements such as form, texture, light, colour, effect of light on colour and texture, organization of space in design, space pattern.
- 5.2 Importance of colour as art element, Various colour scheme.

## **6 Anthropometrics Data**

- 6.1 Relation of human measurement to furniture and movement to circulation patterns.

## **7 Interior materials**

7.1 Different interior materials, paneling, partitions, finishing materials, furniture.

7.2 False ceiling, Flooring, Paints.

## **8 Interior of Residential Building**

8.1 Use of space, circulation, standard size of furniture.

8.2 Plans and elevation of interior with furniture for living space, dining space, kitchen, bed room, guest room etc.

## **9 Interior of small commercial building.**

9.1 Planning of interior of small commercial units such as offices, consulting chambers, shops etc.

9.2 Furniture details such as executive table, architectures table etc. used in commercial units.

### **E. COURSE COVERAGE UPTO INTERNAL ASSESSMENT**

Chapters 1, 2, 3, 4, 5

### **F. RECOMMENDED BOOKS:**

<b>Sl. No</b>	<b>Name of Authors</b>	<b>Titles of Book</b>	<b>Name of Publisher</b>
1	David Van Dommalan	Designing and decorating interiors	Jhon Wiley Sons
2	National building code of India		B.I.S
3	P. Stharamamn	Interior Design and Decoration	CBS Publishers & Distributors
5	Julius panero	Human dimension &interior space	Whitney Library of Design
6	Frank D.K Ching	Interior design illustrated	Jhon Wiley Sons

# Pr 1. CONSTRUCTION WORKS PRACTICE & MS PROJECT

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6 <sup>th</sup>
Total Period:	75	Examination	3 hrs
Lab. periods:	5P/week	Term Work	25
Maximum marks:	50	End Semester Examination:	25

## A. RATIONALE

Construction works involve construction, fabrication, testing and proper management. The practical course aims at exposing students at all these tasks. The course aims at imbibing the skills and attitude required at construction industries.

Microsoft Project is professional software that can help project managers. Team members will have better usability and control over hours of work. The applications help in developing plans, assigning resources to tasks, tracking budget management, workload analysis and reporting.

## B. COURSE OBJECTIVES

On completion of the course students will be able to-

1. Know the construction tools and select as per requirement.
2. Construct brick walls and comprehend the challenges associated
3. Fabricate formworks and reinforcements
4. Evaluate compressive strength of concrete by conducting non-destructive tests
5. Know different plumbing tools and fixtures
6. Use MS Project to plan, schedule and report a project

## C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
<b>PART I: Construction work Practices</b>		
1	Tools for construction of masonry	06
2	Construction of brick walls	06
3	Formwork fabrication	08
4	Fabrication of reinforcements	10
5	Non-destructive tests for concrete	05
6	Pipe joints and Plumbing fixtures	05
<b>PART II: MS Project</b>		
1	Introduction to Microsoft Project	04
2	Creating a project plan	05
3	Basics of Microsoft Project	06
4	Tracking the project progress	06
5	Project Reporting	07
6	Custom views and field	07

## D. COURSE CONTENTS

### PART I: Construction work Practices

- 1 Study of tools required for construction of masonry.
- 2 Lay out Plan of a building.
- 3 Construction of 1 & 1 ½ Brick thick walls in English Bond in Mud

- mortar including a corner.
- 4 Construction of 1 & 1 ½ Brick thick Pillar in Mud mortar.
  - 5 Bar bending and fabrication of reinforcements for a beam.
  - 6 Bar bending and fabrication of reinforcements for a slab.
  - 7 Bar bending and fabrication of reinforcements for a lintel with chajja.
  - 8 Bar bending and fabrication of reinforcements for a column.
  - 9 Conducting a Non destructive compressive strength test on concrete beam using rebound Hammer as per I.S:1311(Part-2)-1992.
  - 10 Study of pipe joints and plumbing fixtures.
  - 11 **Field visits:**  
Visit to a construction site of a building where the following works are in progress.  
Excavation of foundation, b) Masonry works, c) Plumbing works d) Painting (interior/ exterior), e) Wood works, f) Fabrication & concreting works, g) Flooring

## **PART II: MS Project**

- 1 **Introduction to Microsoft Project**
  - 1.1 Project Management-Definition & concept
  - 1.2 Features of Microsoft project
  - 1.3 MS project scheduling for engineering
- 2 **Creating a project plan**
  - 2.1 Basic information for a new project
  - 2.2 Creating project from a blank
  - 2.3 Creating project from existing
- 3 **Basics of Microsoft Project**
  - 3.1 Estimating a project
  - 3.2 Project Task
  - 3.3 Project Resources
- 4 **Tracking the project progress**
- 5 **Project Reporting**
- 6 **Custom views and field**

## **E. RECOMMENDED BOOKS**

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	S.C.Rangawala.	Building Construction	Charotar Publishing



			House Pvt. Limited
2	S.S. Bhavikatti,	Building Construction	Vikas Publication
4	BIS Publication	Hand Book on Reinforcement Detailing (SP-34)	

## Pr 2. LAND SURVEY PRACTICE – II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6 <sup>th</sup>
Total Period:	75	Examination	3 hrs
Lab. periods:	5P/week	Term Work	25
Maximum marks:	75	End Semester Examination:	50

### A. RATIONALE

Current age Civil Engineering professionals are required to be conversant with traditional as well as modern equipments and techniques for creating accurate maps. The course trains the students in skill sets required to use traditional high-end equipments and modern tools.

### B. COURSE OBJECTIVES

On completion of the course students will be able to-

1. Conduct trigonometric leveling work in the field with the help of plane table surveying or geodetic surveying.
2. Prepare contoured maps or plans requiring both the horizontal as well as vertical control
3. Set out circular curve in the field.
4. Prepare survey map by conducting traverse survey with theodolite.
5. Lay out the construction plan of different types of structures at the site.
6. Study and use of modern electronic surveying instruments for its different applications.

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Trigonometrical surveying & Tacheometry	10
2	Setting out curves and site surveying	10
3	Study of map and map series	10
4	GPS & DGPS and ETS	25
5	GIS and map preparation using GIS	20

### D. COURSE CONTENTS

#### 1.0 TRIGONOMETRICAL SURVEYING & TACHEOMETRY:

- 1.1 Determination of height of 3 objects whose bases are accessible
- 1.2 Determination of stadia constants
- 1.3 Determination of horizontal distance and elevation with Staff vertical, by stadia method

#### 2.0 SETTING OUT CURVES AND SITE SURVEYING:

- 2.1 Setting out a simple circular curve by offsets from long chord
- 2.2 Setting out a simple circular curve by offsets from the tangent
- 2.3 Setting out a simple circular curve by offsets from chords produces
- 2.4 Setting out a simple circular curve by Rankine's method of tangent angle (Deflection angles)  
Setting out a site the center line and foundation width of a building from the given plan
- 2.5 Setting out the foundation line for a culvert

2.6 Dividing an area into plots of given size

**3. STUDY OF MAP AND MAP SERIES:**

- 3.1 Physical Map
- 3.2 Topographic Map
- 3.3 Road Map
- 3.4 Political Map
- 3.5 Economic & Resources Map
- 3.6 Thematic Map
- 3.7 Climate Map
- 3.8 Open Series map and Defense Series Map

**4. STUDY ON GPS & DGPS AND ETS:**

- 4.1 GPS: - Global Positioning, GPS Signals, Errors of GPS, Positioning Methods
- 4.2 DGPS: - Differential Global Positioning System
  - 4.2.1 Base Station Setup
  - 4.2.2 Rover GPS Set up
  - 4.2.3 Download, Post-Process and Export GPS data
  - 4.2.4 Sequence to download GPS data from flashcards
  - 4.2.5 Sequence to Post-Process GPS data
  - 4.2.6 Sequence to export post process GPS data
  - 4.2.7 Sequence to export GPS Time tags to file
- 4.3 ETS: - Electronic Total Station
  - 4.3.1 Distance Measurement
  - 4.3.2 Angle Measurement
  - 4.3.3 Leveling
  - 4.3.4 Determining position
  - 4.3.5 Reference networks
  - 4.3.6 Errors and Accuracy

**5. STUDY OF GIS AND MAP PREPARATION USING GIS**

- 5.1 Components of GIS, Integration of Spatial and Attribute Information
- 5.2 Three Views of Information System
  - 5.2.1 Database or Table View, Map View and Model View
- 5.3 Spatial Data Model
- 5.4 Attribute Data Management and Metadata Concept
- 5.5 Prepare data and adding to Arc Map.
- 5.6 Organizing data as layers.
- 5.7 Editing the layers.
- 5.8 Switching to Layout View.
- 5.9 Change page orientation.
- 5.10 Removing Borders.
- 5.11 Adding and editing map information.
- 5.12 Finalize the map

**E. RECOMMENDED BOOKS:**

Sl. No	Name of Authors	Titles of Book	Name of Publisher
1	R. Agor	A text book of surveying and leveling	Khanna Publishers,
2	B. C. Punmia	Surveying Vol. I, II, III	Laxmi Publication
3	D. Gaikwad, S. Chand & Co.	Advanced Surveying	
4	Bhatta	Remote sensing & GIS	Oxford Publication

## **REFERENCE Materials**

1. <https://theconstructor.org/surveying/surveying-principles-methods-civil-engineering/13048/>
2. <https://www.novatel.com/an-introduction-to-gnss/chapter-2-basic-gnss-concepts/>
3. [http://gps.alaska.edu/jeff/Spatial\\_Reference/Freymueller\\_DOT\\_GPS.pdf](http://gps.alaska.edu/jeff/Spatial_Reference/Freymueller_DOT_GPS.pdf)
4. [https://drive.google.com/file/d/0B7srsI9Fr4QdUzAzSlRwZnNRZ3M/view :-](https://drive.google.com/file/d/0B7srsI9Fr4QdUzAzSlRwZnNRZ3M/view:-)
5. [Surveying and Levelling by N.N. Basak, 2nd Edition](#)
6. [https://2018.foss4g-na.org/sites/default/files/slides/survey\\_resurvey\\_cadastral\\_layer Odisha.pdf](https://2018.foss4g-na.org/sites/default/files/slides/survey_resurvey_cadastral_layer_Odisha.pdf)
7. <http://www.lawsfindia.org/pdf/orissa/2012/2012OR5.pdf>
8. [http://revenueodisha.gov.in/sites/default/files/document/DILRMP/SOP\\_MRR\\_2016.pdf](http://revenueodisha.gov.in/sites/default/files/document/DILRMP/SOP_MRR_2016.pdf)
9. [http://revenueodisha.gov.in/sites/default/files/document/Govt\\_Land/22958\\_4\\_8\\_14.pdf](http://revenueodisha.gov.in/sites/default/files/document/Govt_Land/22958_4_8_14.pdf)
10. <https://www.google.co.in/search?q=map+reading+and+interpretation+ppt&oq=Map+reading+and+&aqs=chrome.3.69i57j0l5.9755j0j7&sourceid=chrome&ie=UTF-8>
11. Map Use: Reading, Analysis and Interpretation by Juliana O. Muehrcke and Philip Muehrcke
12. <http://indiageospatialforum.org/2012/proceedings/ppt/P%20K%20parida.pdf>
13. <http://www.indiana.edu/~paleoind/Resources/Guide%20to%20Topographic%20Maps.pdf>
14. <http://www.dst.gov.in/sites/default/files/nationalmappolicy.pdf>
15. Remote sensing and GIS / BasudebBhatta, 2<sup>nd</sup> edition, New Delhi, India, Oxford University Press, - Oxford higher education.
16. [http://www.gisresources.com/basic-of-photogrammetry\\_2/](http://www.gisresources.com/basic-of-photogrammetry_2/)
17. [http://giswin.geo.tsukuba.ac.jp/sis/tutorial/Fundamentals of GIS Estoque.pdf](http://giswin.geo.tsukuba.ac.jp/sis/tutorial/Fundamentals_of_GIS_Estoque.pdf)
18. [Learning Material Approved by R&DM Deptt., Govt. of Odisha](#)

## Pr 3. CADD Lab and Design & Detailing Practice

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6th
Total Period:	45	Examination	3 hrs
Practical periods:	3P/week	Sessional Examination:	25
Maximum marks:	50	Practical Examination:	25

### A. RATIONALE

The course intends to imbibe necessary skills in using software towards design and drafting.

### B. COURSE OBJECTIVES

On completion of the course students will be able to

1. Draw necessary detailing and schedule of bars for the various structural members
2. Draw important components of buildings using AutoCAD
3. Draw connectors using AutoCAD
4. Use STADD Pro in modeling structural members
5. Analyze the stress and deformation pattern in structural members
6. Design of buildings using STADD Pro software
7. Prepare building drawings suiting to approval needs prescribed by regulatory bodies

### C. TOPIC WISE DISTRIBUTION

Chapter	Name of topics	Hours
1	Structural Detailing Practice	20
2	Use of STADD Pro Software	15
3	Revit Architecture Software	10

### D. COURSE CONTENTS

#### 1.0 Structural Detailing Practice:

Draw the following with necessary details and schedule of bars from supplied sketches or given references such as SP 34

- 1.1 Slab, beam and lintel with chajja as in a simple building (Help from Sections 8 & 9 of SP 34 may be taken ) (Plate I)
- 1.2 Columns, column-beam connections with & without splicing, isolated footing, staircase (Help from sections 6, 7, 10 of SP 34 may be taken)(Plate 2)
- 1.3 Different types of bolt connections, welded connections. (Plat3)
- 1.4 Details of Pile and Pile cap

#### 2.0 Use of STADD Pro Software:

- 2.1 2-D Modelling of structures, Use of Structure wizard, Geometry, Property, Support, Loads and combinations, Analysis
- 2.2 Analysis of a Continuous beam with more than two span subjected to udl and point load
- 2.3 3-D modeling of building structures ,dead load, live load, earthquake and wind load analysis, design of a 3 storeyed building and preparation of reinforcement drawing and detailing
- 2.4 Introduction to STADD foundation.

### **3.0 Revit Architecture Software:**

- 3.1 Basics- Modify, Wall, Door, Window, Component Room, Roof, Floor, Grid, Lines, Dimension, Section, Level, Text, View
- 3.2 Modelling- Ramp, Railing, Stair
- 3.3 Site- Topo surface- Parking Component, Site Component
- 3.4 Align, Split, Trim, offset, Match type, Line work, Paint, Scale, Unit
- 3.5 3D View
- 3.6 Preparation of approval drawing of a double storied residential building from given specifications with its 3D view using above commands

#### **SOFTWARES REQUIRED:**

- |                                       |                   |
|---------------------------------------|-------------------|
| 1) STADD-Pro/V8i (latest Version)     | - Bentley         |
| 2) AutoCAD (Architecture) 2010 (Book) | -William G. Wyatt |

## Pr4. PROJECT Phase - II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	6 <sup>th</sup>
Total Period:	75	Examination	3 hrs
Lab. periods:	5 P / week	Sessional	50
Maximum marks:	150	End Sem Examination	100

### RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Civil engineering and practices in real life situations, so as to participate and manage a large Civil engineering projects, in future. Entire Project spreads over 5<sup>th</sup> and 6<sup>th</sup> Semester. Part of the Project covered in 5<sup>th</sup> Semester was named as *Project Phase-I* and balance portion to be covered in 6<sup>th</sup> Semester shall be named as *Project Phase-II*.

### OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop software packages or applications and implement these for the actual needs of the community/industry.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in Project design.
- To develop the skill of writing Project Report

### Project Phase-I and Phase-II

The Project work duration covers 2 semesters(5<sup>th</sup> and 6<sup>th</sup> sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group was done in the beginning of 5<sup>th</sup> semester under Project Phase-I. The students were allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work and Design of the system also have to be complete in Phase-I. Development may also begin in this phase. Project Milestones are to be set so that progress can be tracked .

In Phase-II Development, Testing, Documentation and Implementation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-II in 6<sup>th</sup> semester there shall be one presentation by each group on whole Project work undertaken by them.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	Performance Criteria
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

The Project Report need to be prepared as per standard format and following is the indicative format. The Teacher Guide may make minor alteration keeping the sense in tact.

### Organization of Project Report

#### 1. Cover page:

It should contain the following ( in order)

- (i) Title of the Project
- (ii) “Submitted in partial fulfillment of the requirements for the Diploma in <Branch Name>”
- (iii) By Name of the Student(s)
- (iv) Logo of the Institution
- (v) Branch Name/Depart Name and Institution Name with Address
- (vi) Academic Year

#### 2. 1<sup>st</sup> Inner page

Certificate:

It should contain he following

“This is to certify that the work in this Project Report entitled <Project Title> by <Name of student(s)> has been carried out under my supervision in partial fulfillment of the requirements for the Diploma in <Branch Name>” during session <session > in <Branch /Department Name> of <Institute name> and this work is the original work of the above student(s).

Seal and signature of the Supervisor/Guide with date

#### 3. 2<sup>nd</sup> Inner Page

Acknowledgement by the Student(s)

#### 4. Contents.

#### 5. Chapter wise arrangement of Reports

#### 6. Last Chapter: Conclusion



It should contain

- (i) Conclusion
- (ii) Limitations
- (iii) Scope for further Improvement

## 7. References

## **Pr-5 LIFE SKILL**

**(Common to All Branches)**

<b>Practical</b>	<b>2 Periods per week</b>	<b>Sessional</b>	<b>25 Marks</b>
<b>Total Periods</b>	<b>30 Periods</b>	<b>Total Marks</b>	<b>25 Marks</b>

**Objective:** After completion of this course the student will be able to:

- Develop team spirit i.e. concept of working in team
- Apply problem solving skills for a given situation
- Use effective presentation techniques
- Apply task management techniques for given projects
- Enhance leadership traits
- Resolve conflict by appropriate method
- Survive self in today's competitive world
- Face interview without fear

### **DETAIL CONTENTS:**

#### **1. SOCIAL SKILL**

Society, Social Structure, Develop Sympathy and Empathy

Swot Analysis – Concept, How to make use of SWOT

Inter personal Relation: Sources of conflict, Resolution of conflict ,  
Ways to enhance interpersonal relation

#### **2. PROBLEM SOLVING**

Steps of Problem solving:

- Identify and clarify the problem,
- Information gathering related to problem,
- Evaluate the evidence,
- Consider alternative solutions and their implications,
- Choose and implement the best alternative,
- Review
- Problem solving techniques:

1) Trial and error, 2) Brain storming, 3) Lateral (Out of Box) thinking

#### **3. PRESENTATION SKILL**

Body language , Dress like the audience

Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,

Voice and language – Volume, Pitch, Inflection, Speed, Pause

Pronunciation, Articulation, Language, Practice of speech.

Use of AV aids such as Laptop with LCD projector, white board etc.

#### **4. GROUP DISCUSSION AND INTERVIEW TECHNIQUES**

*Group Discussion:*

Introduction to group discussion, Ways to carry out group discussion,

Parameters— Contact, body language, analytical and logical thinking,  
decision making

*Interview Technique :*

Dress, Posture, Gestures, facial expression, Approach

Tips for handling common questions.

#### **5. WORKING IN TEAM**

Understand and work within the dynamics of a groups.

Tips to work effectively in teams,

Establish good rapport, interest with others and work effectively with them  
to meet common objectives,

Tips to provide and accept feedback in a constructive and considerate way ,

Leadership in teams, Handling frustrations in group.

## 6. TASK MANAGEMENT

Introduction, Task identification, Task planning ,  
organizing and execution, Closing the task

### PRACTICAL

**List of Assignment:** *(Any Five to be performed including Mock Interview)*

**a. SWOT analysis:-**

Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.

- a) Your past experiences,
- b) Achievements,
- c) Failures,
- d) Feedback from others etc.

**b. Solve the True life problem assigned by the Teacher.**

### 3. Working in a Team

Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slum area, social activities like giving cloths to poor etc.( One activity per group where Team work shall be exhibited)

### 4. Mock Interview

### 5. Discuss a topic in a group and prepare minutes of discussion.

### 6. Deliver a seminar for 5 minutes using presentation aids on the topic given by your teacher.

### 7. Task Management

Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management (with Break up into sub tasks and their interdependencies and Time)

**Note:** -1. Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic.

**Note:** -2. The following Topics may be considered for Seminar/GD in addition to other Topics at the discretion of the Teacher.

(Comparison with developed countries, Occupational Safety, Health Hazard, Accident & Safety, First-Aid, Traffic Rules, Global Warming, Pollution, Environment, Labour Welfare Legislation, Labour Welfare Acts, Child Labour Issues, Gender Sensitisation ,Harassment of Women at Workplace)

### METHODOLOGY:

*The Teacher is to explain the concepts prescribed in the contents of the syllabus and then assign different Exercises under Practical to the students to perform.*

### Books Recommended:-

Sl.No	Name of Authors	Title of the Book	Name of the Publisher
01	E.H. Mc Grath , S.J	Basic Managerial Skills for All	PHI
02	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
03	Adair, J	Decision making & Problem Solving	Orient Longman
04	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
05	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.

## Equipment List

### LAND SURVEY PRACTICE II ( For Group Size-30 Students)

Sl No.	Name of Equipments	Quantity Required in Nos.
1	Substance bar	06
2	Photogrametry equipments and 3-D maps	06
3	Theodolite Traversing -Transit Vernier Theodolite-Telescope:Length 210mm, Magnification 30X, Resolving Power 1.3mm, Minimum focusing distance 1.5m, Stadia Multiplying Constant-100, Additive Constant-0(zero),Image-Erect, Accuracy-5mm/Km, Sensitivity of vertical circle-200seconds/2mm, Horizontal circle-100 to115mm, Graduation-20minutes, Vernier-20sec, Vertical Circle -100 to 115mm, Graduation-20 minutes, Vernier -20sec, /00With optical plummet, with telescope level and plate level supplied with all standard accessories as per BIS 2988-1965 including Tripod stand & Box	06
4	Digital Theodolite & EDM	06
5	Total Station (Auto Tracking & Auto Pointing) with all accessories: 1. Data transfer cable, 2. Aluminium Stand, 3. Both side display, 4. Detachable tribarch having following features, Focusing Mode, a)Auto focus mode, b) Power focus mode, c) Manual focus mode, d) Red dot appearing on the object where distance has to be measured, Graph of entire survey displayed on screen of total station. On board preloaded graphical software including are, perimeter, volume (cut/fill), 7500 points on board memory range, prism, single prism3000m (under normal condition) Three prism400m can measure distance without reflections up to 80m , Angle accuracy:5" (Seconds), Temperature, pressure sensor in built, Large LCD display screen 8 lines,20 characters,Battery12 hours continuous, angleony (angle + distance 6hrs.minimum) Charger with graphic display & discharge function.	06
6	DGPS (Dual frequency)	05
7	Electronic Total station	05
8	AutoCAD software	15 user
9	GIS software	Multiuser
10	Image processing software	multiuser

### CONSTRUCTION WORKS PRACTICE LABORATORY & MS PROJECT ( For Group Size-30 Students)

Sl No.	Name of Equipments	Quantity Required in Nos.
1	Masonry tools:  Steel wire brush, Mason's Trowel, Pointing Trowel, Hacking hammer, Trig square (300 x 600mm), Blaster Chisel, Hammer (2 lbs), Cold steel chisel, straight edge (1800 mm), straight edge (1200mm), plumb bob (250g) with thread, steel measuring tape (3m), mortar pan (350 dia), GI bucket (15 Ltr), spade, wheel barrow, sprit level (300mm), wooden float (1200mm), wooden float (600mm), steel towel, Gauge Box (1.25 ft), Sand screen, Water storage tank (500 ltr.) Plastic mug, PVC tube (5mm dia), 20m, Nylon thread bundle (100 ft), Cotton Thread bundle (100 ft)	5 each

2	Claw hammer (216), Ball pin hammer (2 lb), Hand saw (18"), Tenon saw (12"), Wooden making gauge, wooden mortise gauge, spirit level (12" long), Tri square (5") Drill machine with bits from 3mm to 25 mm, fammer chisel (1 ½ "), Mortise chisel (½ "), cutting plier (8"), Screw driver set, making knife / scribe, Hacksaw frame with blade (12"), spanner set, wire rail (1 ½ "-1 Kg), Wire nail (2 ½ "-1 kg), wire nail (3" – 1 kg), portable cutter with blade	5 each
3	Measuring steel tape (15m & 30m), binding hook, bending lenr (8mm, 10mm, 12mm, 16mm, 20mm, 25mm), rail piece (450-600mm long), cold chisel flat nose, Hammer (10lb), trysquare (300 x 600mm) Hacksaw frame, standard wire gauge, cutting blades for hacksaw, bar bending machine (36mm dia), Bar shearing machine (36mm dia), Hand shearing machine (upto 12mm dia), bending tables with support and sleeper, Bar Cutting Machine	5 each
4	Water supply plumbing fitting - (1" dia) GI & PVC – bend, draw, short piece, ripple, socket, plug, reducer socket, union tee, RS tee, Reducer socket etc	5 each
5	Sanitary plumbing fittings–(4" dia) GI & PVC- Bend, Door Bend, T-Juction, Y-Juction, Short piece- P,S,Q trap, vent pipe, cowl.	5 each
6	Fixtures – Wash basin, sink, Indian pan, European pan (Commode), Anglo Indian Pan, Videt, Showers(Overhead, Health, Hand), Bib-cocks with hot & cold water Mixture, Connection pipe, waste, Waste Pipe, Bibcock, Pillar cock, Angle cock, Stop cock, Valves – oneway (Reflux), full way	5 each
7	MS Project software	Multi user

**CIVIL ENGG. CAD LABORATORY (FOR A GROUP OF 30 STUDENTS)**  
**(Can be used for Engg. Drawing/Civil Engg. Drawing-I & II /Estimation & Cost Evaluation Practice – I & II)**  
**Gr. Size -30students**

Sl. No.	Item with Specification-	QNTY in Nos.
1	STAAD-Pro -V8i(Latest Educational Version) software	30 users
2	AutoCAD-2016 or lates Educational version	15 users
3	Desk Top Computer with following latest version configuration :	30
4	Laptop Computer with following latest version configuration :	1
5	Online UPS: 15KVA	
6	Laser Printer- Paper size:A4	1
7	Document Scanner A4/Legal size, Resolution: 600x600, Flat Bed size:A4	1
8	Plotter(44") with accessories in complete set	1
9	LCD projector 4000 ansi lumen with screen	1