STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA								

TEACHING AND EVALUATION SCHEME FOR 5th Semester (Civil Engineering)(PT) (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-I	5	-	-	20	80	3	100
Th.3		Hydraulic and Irrigation Engineering	5	-	-	20	80	3	100
Th.4		Highway Engineering	5	-	-	20	80	3	100
		Total	19	-		80	320	-	400
		Practical							
Pr.1		Civil Engg. Lab-II	-	-	6	50	100	-	150
Pr.2		Civil Engg. Drawing-II Lab	-	-	5	25	50	-	75
		Student Centred Activities(SCA)		-	3	-	-	-	-
		Total	-	-	14	75	150	-	225
		Grand Total	**19**	**-**	**14**	**155**	**470**	**-**	**625**
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 5TH SEMESTER

For

DIPLOMA IN CIVIL ENGINEERING (PART TIME)

(Effective From 2020-21 Session)
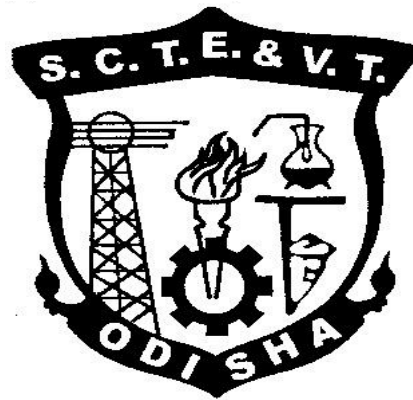
STATE   COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

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 – I

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th(PT)
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 900 bend and 450 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.R oy	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

Th3. HYDRAULICS & IRRIGATION ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th(PT)
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
PART: A (Hydraulics And Machines)		
1	Hydrostatics	12
2	Kinematics Of Fluid Flow	18
3	Pumps	05
Part: B (Irrigation Engineering)		
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

Th4. HIGHWAY ENGINEERING

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th(PT)
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 Glossory 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 o f providing super – elevation

3   Road Materials

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   **Road Pavements**

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

- Mechanical stabilization
- Lime stabilization
- Cement stabilization
- Fly ash stabilization

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:

- Surface dressing
  - (i) Premix carpet and (ii) Semi dense carpet
- Bituminous concrete
- Grouting

4.6 Rigid Pavements:
Concept of concrete roads as per IRC specifications

5   **Hill Roads:**
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   **Road Drainage:**
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   **Road Maintenance :**
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 Enginnering.	S. Chand

Pr.1 CIVIL ENGINEERING LABORATORY-II

Name of the Course: Diploma in Civil Engineering			
Course code:		Semester	5th(PT)
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.	HYRAULICS 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 pippette 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 φ 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.
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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/Nephlometer/Jackson's Candle Turbidimeter.

4.2   Determination of pH of Water sample using (a) pH – meter (b) colour Comparator.

4.3   Determination of dissoloved oxygen content of water sample.

4.4   Determination of Cloride content of a Water sample using method of titration.

4.5   Determination of Coagulant (Alum) dose requirement for a turbid water sample by Jar Test.

4.6   Detremination of B.O.D. of waste water sample.

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.

Pr2. CIVIL ENGINEERING DRAWING – II

Name of the Course: Diploma in Civil Engineering(PT)			
Course code:		Semester	5th
Total Period:	90	Examination	3 hrs
Lab. periods:	6 P/week	Term Work/Sessional	25
Maximum marks:	75	End Semester Examination:	50

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