Scheme of Teaching and Examination for

6 th Semester of 3 Years Diploma in Civil Engineering

Duration of Semester : **14 Weeks**

Student Contact Hours : **36 Hrs**

Total Marks : **800**

Effective from : 2017 -18 Session

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Industrial Engineering & Management	601	Theory	3		-	3	100	80	20	26	40
2.	Design of Steel Structure	CIV 604	Theory	3		-	3	100	80	20	26	40
3.	Estimating & Costing	CIV 605	Theory	3	-	-	3	100	80	20	26	40
4.	Contract & Account	CIV 606	Theory	3	-	-	3	100	80	20	26	40
5.	Elective II	CIV 607/608/609	Theory	3	-	-	3	100	80	20	26	40
6.	Design of Steel Structure Lab	CIV 610	Sessional	-	-	2	-	50	30	20	-	25
7.	Estimating & Costing Lab	CIV611	Sessional	-	-	2	-	50	30	20	-	25
8	Contract & Account Lab	CIV612	Sessional	-	-	2	-	50	30	20	-	25
9.	Elective II Lab	CIV 613/614/615	Sessional	-	-	2	-	50	30	20	-	25
10.	Project Work	603	Sessional	-	-	4	-	50	30	20	-	25
11.	Professional Practices	602	Sessional	-	-	4	-	50	30	20	-	25
Total Hours of Teaching per week :				**15**		**16**						

Elective II (Adv Structure - CIV-607/ Water Resources Planning & Management-CIV 608/ Earth quake Resistant Structure-CIV609)

Total Marks : Theory : Practical : Sessional :

L : Lecture, T : Tutorial P : Practical

Note: 1. Period of Class hours should be of 1 hrs duration as per AICTE norms.

2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.

3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.

4. Board will depute examiner for Practical examination.

5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

SUBJECT : INDUSTRIAL ENGINEERING AND MANAGEMENT
SUBJECT CODE : 601
FULL MARKS : 80+20= 100
Hours : 42

L	T	P
3	0	0

Rationale:

After completion of three years of technical training, Polytechnic students are expected to enter in to the World of Work. The business environment is altogether different and new to the students. A proper introduction and understanding of Business Processes is therefore essential for all Polytechnic students. Management is a subject which deals with basics of Management science required to understand the processes the in Industrial & Commercial environment. This will enable the students of Polytechnic to become familiar and to understand various Business Organizational structures, their functioning and the Role these technicians will have to play in these setups with responsibilities.

Industrial Engineering is concerned with the design, improvement and installation of integrated systems of people, materials, equipment and energy. Polytechnic students must be able to analyze the use and cost of the resources of the organization in order to achieve the objective, i.e. to increase productivity, profits etc. and carryout the policies efficiently and effectively.

Objective:

The students will able to:

1. Familiarize environment in the world of work.
2. Explain the importance of management process in Business.
3. Identify various components of management.
4. Describe Role & Responsibilities of a Technician in an Organizational Structure.
5. Apply various rules and regulations concerned with Business & Social responsibilities of the technician.

Detailed Syllabus

1. **Productivity :** **02 Hrs**
   Production and productivity, importance of productivity, factors affecting productivity, means of increasing productivity.
2. **Plant Layout and Material Handling :** **02 Hrs**
   Definition of plant layout, objectives of good plant layout, principles of plant layout, types of plant layout, flow pattern, steps in planning the layout for a new enterprise, definition of material handling, functions and principles of material handling, material handling devices.

3. **Work Study :** **04 Hrs**

Definition, concept and need for work study, objectives of method study and work measurement, basic procedure/steps in method study, recording technique, critical examination, principles of motion economy, stop watch procedure for collecting time study data, including performance rating and allowances, work sampling.

4. **Production Planning and Control (PPC) :** **04 Hrs**

Definition and objectives of PPC, functions of PPC, routing, scheduling, loading, dispatching, production control definition and objectives, principle of sound production control system.

5. **Material, Purchase and Stores Management :** **04 Hrs**

Definition, functions& objectives of materials management, inventory control, economic order quantity (EOQ), ABC analysis. Objectives of purchasing department, buying techniques, purchasing procedure (steps involved in one complete purchasing cycle); functions of stores department, location and layout of stores, receipt and issue of materials.

6. **Quality Control and TQM :** **04 Hrs**

Meaning of quality and quality control, dimensions of quality, quality circle, concept and definition of TQM, elements of TQM, Kaizen, 5 'S' and six sigma.

7. **Management :** **04 Hrs**

Various definition, concept of management, levels of management, administration and management, scientific management by F. W. Taylor. Principles of management (14 principles of Henry Fayol). Functions of management - planning, organizing, coordinating, directing, controlling, decision making.

8. **Organizational Management :** **04 Hrs**

Organization - definition, steps in forming organization. Types of organization. Types of organization - line, line and staff, functions, project type. Departmentation- Organized and decentralized, authority and responsibility, span of control (management). Forms of ownership - proprietorship, partnership, joint stock company, co-operative society, govt. sector.

9. **Human Resource Management :** **06 Hrs**

Personnel Management – Introduction, definition, function. Staffing – Introduction to HR, Introduction to HR Planning, Recruitment procedure. Personnel- Training & Development – Types of training, Induction, Skill enhancement. Leadership & Motivation – Leadership- Styles & types, Motivation- Definition, Intrinsic, &Extrinsic, Moslow's theory of Motivation and its significance. Safety Management – Causes of accident, Safety Procedures. Introduction, Objectives & feature of Industrial Legislation such as – Factory act, ESI act, Workman compensation act, Industrial dispute act and salary & wages.

10. **Financial Management :** **04 Hrs**

Financial Management- Objectives & Functions. Capital Generation & Management- Types of capitals, Sources of finance. Budgets and accounts- Types of budgets, Production budget (including varience report), Labour budget, Introduction to Profit & Loss Accounts (Only concept), Balance sheet etc.

11. **Entrepreneurship :** **04 Hrs**

Concept and definition of entrepreneur and entrepreneurship, factors influencing entrepreneurship, entrepreneurial characteristics, need for promotion of entrepreneurship and small scale industries, steps in setting up a small scale industrial enterprise.

References Books :

1. Industrial Engineering and Management by O. P. Khanna
2. Industrial Engineering and Production Management by M. Mahajan.
   Publisher :Dhanpat Rai Publication (P) Ltd. New Delhi

3. Business Administration and Management by Dr. S. C. Saksena
   Publisher :Sahitya Bhawan, Agra.

Subject : Design of Steel Structure
Course code : CIV604
Full Marks : 80+20=100
Hours : 42

Aim:-

1. Study of design and implementation steel structure used in building construction.

Objective:-Students will be able to:-

1. Analyze the steel structure and its members for determining the forces acting in the member
2. Select proper material and sections from steel table
3. Calculate design values for members
4. Use IS 875 Part 1, 2 & 3 provisions for dead load, live load and wind load.
5. Design the tension member, compression member, beam, purloins and column bases and their connection.
6. Use of IS 800 – 2007 for designing the member.
7. Read and interpret the structural drawings
8. Prepare the detailed working drawing of steel roof truss, showing sections and connections.

Pre-Requisite:-

1. Student should understand the load bearing capacity of components of building.
2. Student should be perfect in building drawing and its reading process.

Unit No	Topic	Contact periods	Marks
1	Introduction	3	3
2	Limit State Design	4	5
3	Design Of Connections And Detailing	12	12
4	Design Of Tension Members by L.S.M	6	10
5	Design Of Compression Members and Column Bases by L.S.M	12	12
6	Design of flexural members for BM and SF by L.S.M	7	8
7	Steel Roof Truss	8	10
8	Plastic Analysis	12	10

Content: Theory (DESIGN OF STEEL STRUCTURES) 4 hours per week

Unit -1

Introduction

Advantages and disadvantages of steel as construction material. Types of sections ,Grades of steel(IS 2062) and strength characteristics; Use of steel table(SP6-Part1); Types of loads on steel structure and its I. S. code specification. Methods of design and comparison between them.

Unit-2

Limit State Design

Basis for design– Classification of Limit States– Characteristic and Design Actions– Ultimate and Design Strengths- Partial Safety Factors for Loads and Materials– Factors Governing the Ultimate Strength: Stability, Fatigue and Plastic collapse– Serviceability.

Unit-3

Design Of Connections And Detailing

General- Types of connections– Bolted, Riveted and Welded connections– Rigid and Flexible connections– Components of connections– Basic requirements of connections- Clearance for holes– Minimum and Maximum spacing of fasteners– Minimum edge/ end distances– Requirements of Tacking fasteners. Bolted Connection– Types of bolts– Bearing type Bolts– Nominal and Design shear strengths of bolts– Reduction factors for Long joints, Large grip lengths, Thick packing plates– Nominal and Design bearing strengths of bolts– Reduction factors for over sized and slotted holes– Nominal and Design tensile strengths (tension capacity) of bolts-Simple problems. Welded Connection- Types of welds– Fillet welds– Minimum and maximum sizes– Effective length of weld- Fillet welds on inclined faces–-Design strengths of shop/site welds– Butt welds– Effective throat thickness and effective length of butt weld- Simple problems. Design problems related to eccentric riveted/bolted and welded connections.

Unit-4

Design of Tension Members by L.S.M

Tension Members-effective length and Effective Sectional Area of tension members - Design Strength of Tension members against yielding of gross section requirements: Deflection limits, Vibration, Durability and Fire resistance, against rupture of critical section and due to block shear. Problems on determination of design strength of given members and designing tension members using rolled steel sections for given loads– Design of bolted/riveted and welded connections for tension members –Problems.

Unit-5 Design of Compression Members and Column Bases by L.S.M

Compression Members- Effective Length and Effective Sectional Area of Compression members – Design Stress and design strength– Buckling Class of cross sections– Imperfection factor– Stress reduction factor– Thickness of elements .Analysis and design of axially loaded column. Introduction to lacing and battening (No numerical problem on Lacing and Battening)

Slab base and Gusseted base – Code Provisions (IS:800-2007) – Minimum thickness and Effective Area of Base plate– Design of Slab base for axially loaded columns using bolts/riveted/welds. Introduction to Gusseted base (no numerical problems on gusseted Base).

Unit-6 Design of Flexural Members for BM and SF by L.S.M

General- Effective span of Beams, Design strength of bending,(Flexure), Limiting deflection of beams – Design of laterally supported Simple beams for Bending moment and Shear force using single / double rolled steel sections (symmetrical cross sections only) – Problems. Names of various components of plate girder and their functions with usual IS recommendations

Unit-7 Steel Roof Truss

Types of steel roof truss & its selection criteria. Calculation of panel point load for Dead load; Live load and wind load as per I.S. 875-1987 Analysis and Design of steel roof truss. Design of Angle purlin as per I. S. Arrangement of members at supports.

Unit-8 Plastic Analysis

Plastic Analysis: Analysis of Steel Structures– Methods– Elastic, Plastic and Advanced method of analysis based on IS: 800-2007– Idealized Stress vs Strain curve– Problems. For Structural Steel– Requirements and Assumptions of Plastic method of analysis– Formation of Plastic hinges in Flexural members– Plastic Moment of Resistance and Plastic Modulus of Sections– Shape Factors of rectangular / circular/ I / T-Sections– Collapse load.

Text/ Reference Books:-

1. Dr. N. Subramanian "Steel Structures", Oxford University Press.
2. K.S.Sai Ram "Design of Steel Structures" Pearson-Porling Kindersley Pvt Ltd
3. M.R.Shiyekar "Limit State Design in Structural Steel", PHI Learning Pvt Ltd, 2011
4. S. K. Duggal "Design of steel structure" Tata Macgraw Hill Publication Company ltd. New Delhi
5. M. Raghupati "Design of steel structure" Tata Macgraw Hill Publication Company ltd. New Delhi
6. Ramchandra "Design of steel structure" Dalpatrai & Sonts publication Company ltd. New Delhi
7. S.S. Bhari katti "Design of steel structure" I.K. International Publishing House
8. Kazimi & Jindal "Design of steel structure" Prentice hall India, New Delhi.
9. S.N. Malik "Design of steel structure" Prentice hall India, New Delhi.
10. BIS code: IS 800: 2007

Subject : Design of Steel Structure Lab
Subject Code : CIV610

PRACTICAL SHALL CONSISTS OF SKETCH BOOK AND DESIGN REPORT OF STEEL ROOF TRUSS FOR AN INDUSTRIAL BUILDING, TWO FULL IMPERIAL SIZE SHEET SHALL BE USED FOR DRAWINGS.

1. Sketch Book:

Sketch book shall consists of any five plates out of the below mentioned

1. Typical sketches of sections of tension member, determination of net effective cross sectional area of tension member for angle section.
2. Typical sketches of sections of compression member, determination of effective length for different end conditions.
3. Type of trusses for different spans.
4. Riveted and welded connections for axially loaded member.
5. Column section and slab base
6. Important information of clauses of IS800-1984 and IS875 (Part-1,2 & 3)

2. Design of Steel roof truss:

The student should draw two full imperial size sheets covering design of steel roof truss any one of the truss fink, fan, Pratt, lattice truss for Span from 8 to 16 meter the design shall cover calculations for the dead load, live load, wind load with design of the various elements. The drawing shall include detailing the truss for below mentioned elements.

a. Architectural drawing
b. Data for structural design
c. Key plan at tie level
d. Detailed layout of steel roof truss.
e. Details at end support.

3. Is Codes:

1. IS 800-1984 Indian Standard code of practice for use of structural steel in general building construction, BIS New Delhi.
2. IS-875 Part-1, 2, & 3- 1987 Indian Standard code of practice for use of structural steel in general building construction, BIS New Delhi.
3. IS hand book No. 1 Properties of structural steel rolled section
4. Steel table.

Subject : Estimating & Costing
Course code : CIV605
Full Marks : 80+20=100
Hours : 42

Rationale:

This is a core technology subject which will enable the students to learn core facts, concepts, principles & procedures in Estimating & Costing. With this knowledge and skill, he will be able to prepare estimate before start of construction and systematically procure materials during execution using specifications for ensuring appropriate type of construction processes & quality of engineering products in specialized areas in Building Construction, Irrigation, Transportation and Environmental Engineering.

Objectives: Students should be able to:

1) Decide approximate cost of civil engineering structure.

2) Prepare check list of items of construction.

3) Prepare detailed estimate for civil engineering work.

4) Take measurement of completed work.

6) Compare actual quantity with estimated quantity.

7) Prepare estimate of earthwork and rate analysis of different civil works.

Course Topic/sub Topic

Introduction **2 Hrs**

Meaning of the terms estimating and costing, Purpose of estimating, methods of estimating, Various Performa used in estimates: Measurement/Quantity Sheet, Abstract sheet & material consumption statement form, Types of estimate-Approximate and Detailed.

Approximate estimate– **6 Hrs**

Plinth area rate method, Cubical Content method, Service Unit method and its application, Typical bay method, Approximate Quantity method, problems.

Detailed Estimate **16 Hrs**

Type of detailed estimate and its uses, Detailed estimate, Revised estimate, Supplementary estimate, Revised & supplementary estimate, Maintenance & Repair estimate, Unit quantity method, Total quantity method, Data required for detailed estimate.

Factors to be considered during preparation of detailed estimate,

Preparing checklist–by adoption of Sequence of execution and describing item of works.

Detailed estimate of various items of Load bearing Structure by Long Wall and short wall & Centerline method, for single room and two room with verandah and other residential and public building.

Detailed estimate Double storeyed residential building with staircase.

Estimate of Inclined roof building with King post and queen post truss.

Detailed Estimate of Framed Structure building by centre line method of slab, lintel, T- beam and Column with foundation.

preparation of bar bending schedule.

Percentage of reinforcement for various structural members.

Detailed estimate of Roof slab culvert, pipe culvert and Bridge with return wall and straight splayed wing wall.

Mode of Measurements **4 Hrs**

Units of Measurements for different item of works as perIS1200 &As per PWD specification Book.

Desired accuracy in taking measurements of various items of works

Rules of deductions for openings as per IS 1200 for brick work, plastering, painting

Rate Analysis **8hrs**

Market Rate and labour rate.

Transportation of Materials, capacity of conveyance for different materials. Transportation Charges.

Labour - Categories of labours, labour rates, overhead charges, contractor's profit, water charges.

Preparing rate analysis of different items of work viz P.C.C., Brick work, RCC works, Plastering, flooring only.

District Schedule of rates, completed rates & labour rates.

Estimate for Earthwork **6hrs**

Concept of Lead and Lift. Framing estimate by taking out quantities of Earthwork of Road and Irrigation Canal embankment using mean area and earthwork of BBM septic tank for 25 user sc) Community well for 10m.dia.

Subject : Estimating & Costing Lab
Course code : CIV611

List of Experiments:

1. Prepare Check list of items of Load Bearing type Building
2. Writing the rules of deduction's for below mentioned items of work as per IS1200.
   a) Brick work b) Plastering/Pointing work c) Painting work

3. Taking out quantities of various items of work for load bearing building.

   i) Excavation for foundation
   ii) Plain Cement Concrete of foundation
   iii) U.C.R./BBM a sonry work in foundation and plinth.
   iv) D.P.C.
   v) Plinth Filling.
   vi) Brick Masonry work.
   vii) Flooring, skirting, dados
   viii) Plastering. (Internal & External)
   ix) Wood work in doors.

4. Writing/drafting detailed specifications for some important items of Civil Works.

Learning Resources:

Books:

Sr. No.	Title	Author	Publisher
01	Estimating & costing in Civil Engineering	B.N. Datta	UBS Publishers Distributors Pvt Ltd New Delhi
02	Estimating &costing, Specification and Valuation in Civil Engineering	M. Chakraborti	M. Chakraborti, Calcutta
03	Estimating & costing	S.C. Rangwala	Charotar Publication Anand
04	Estimating & costing	G. S.Birdie	Dhanpat Rai and Sons Delhi

Subject : Contract & Account
Course code : CIV606
Full Marks : 80+20=100
Hours : 42

Rationale:

This is acore technology subject which will enable the students to learn facts, concepts, principles and procedure in contracts and accounts. With this knowledge and skill, he will be able to prepare tender papers for contract and contract documentation before start of construction.

He will get acquainted with procedures and different forms used by PWD as well as private construction firms and will therefore be able to prepare bills and pay contractor for the work as well as penalize for defective work

He will also use the core knowledge of this subject area for assessment of expenses for repairs and maintenance of civil engineering works.

AIM

The students shall be able to:

1) Differentiate between types of contract.
2) Prepare tender documents.
3) Draft tender notice for various types of construction
4) Prepare the Account document (bills)
5) Know the Contractor payment procedure
6) Prepare specification of an item of construction.
7) Calculate the value of a land and old buildings.

Topic/Sub topic

Procedure of execution of work by P.W.D **04 Hrs**

1.1 Organizational structure of P.W.D., functions of their personnel.

1.2 P.W.D. Procedure of initiating the work, administrative approval, technical sanction, budget provision.

1.3 Methods used in P.W.D. For carrying out works contract method and departmental method, rate list method, piece work method, day's work method, department method (NMR and Casual Muster Roll.)

Contract **10 Hrs**

2.1 Definition of contract, Objects of contract, requirements of valid contract

2.2 Types of engineering contractwith advantages and disadvantages their suit abilities- Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, target contract, negotiated contract.

2.3 Class of contractor, Registration of contractor.

2.4 BOT Project: objectives, scope, advantages, disadvantages, examples

Tender &Tender Documents **10 Hrs**

3.1 Definition of tender, necessity of tender, types-local and global.

3.2 Tender notice, points to be included while drafting tender notice, drafting of tender notice.

3.3 Meaning of terms: earnest money, security deposit, validity period, right to reject one or all tenders, corrigendum to tender notice and its necessity.

3.4 Tender documents–list, schedule a, schedule b and schedule C

3.5 Terms related to tender documents–contract conditions: time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items, escalation, arbitration, price variation clause, defect liability period, liquidated and un-liquidated damages.

3.6 Filling the tender by contractor and points to be observed by him.

3.7 Procedure of submitting filled in tender document, procedure of opening tender, comparative statement, scrutiny of tenders, award of contract, acceptance letter and work order.

Unbalanced tender, ring formation accounts in P.W.D. **02 Hrs**

4.1 Various account forms and their uses- Measurement Books, Nominal Muster Roll, Imp rest Cash, Indent, Invoice, Bills, Vouchers, Cash Book, Temporary Advance.

Payment to Contractors **04 Hrs**

5.1 Mode of payment to the contractor-
Interim Payment and Its Necessity,

5.2 Advance Payment, Secured Advance, On Account Payment, Final Payment, First And Final Payment, Retention Money, Reduced Rate Payment, Petty Advance, Mobilization Advance.

Specifications **06 Hrs**

6.1 Necessity and Importance of Specification so fan Items,
Points To be observed in framing Specifications of an Item,

6.2 Types of Specification: Brief and Detailed Specification, Standard and Manufacturers Specification.

6.3 Preparing Detailed Specifications of Items of following Civil Engineering Works.
Building Construction System, Irrigation Engineering System, Transportation Engineering System, Environmental Engineering System

6.4 Legal Aspects of Specification.

Valuation **06 Hrs**

7.1 Definition, Necessity of Valuation.
Definitions–Cost, Price, Value, Characteristics of Value, Factors Affecting Value.

7.2 Types of Value:- Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market

Value, Monopoly Value, Sentimental Value, Factors Affecting Value.

7.3 DEPRECIATION, Obsolescence, Sinking Fund.

Methods of Calculation of Depreciation–Straight Line Method, Sinking Fund Method, Constant Percentage Method Quantity Survey Method.

7.1 Computation of Capitalized Value, Gross Income, Outgoing, Net Income, Years Purchase. Types of Outgoing And Their Percentages.

7.2 Fixation of Rent as Per PWD Practice

Subject : Contract & Account
Course code : CIV612

List of Experiments:

1. Collecting old set of tender document and writing are port on it.
2. Collection of tender notices published in newspapers for various items of civil engineering works. (Atleast5) Write salient features of them.
3. Drafting a tender notice for construction of a civil engineering Work (W.B.M. Road, Residential Building)
4. Preparation of Tender Document for the Building. (Detailed Estimate prepared for R.C.C. Building in Estimating and Costing shall be used)
5. Collection of various account forms from PWD & writing report on it
6. Writing are port on store procedure and account producer of PWD. For it Guest Lecture of PWD official may be arranged.
7. Writing detailed Specifications for one item from each of following:
    a. Building construction system.
    b. Irrigation engineering system.
    c. Transportation engineering system.
    d. Environment engineering system

BOOKS:

Sr. No.	Author	Title	Publisher
01	B.N.Datta	ESTIMATING&COSTING INCIVIL ENGINEERING	UBS Publishers
02	M. Chakraborti	Estimating &costing, Specification and Valuation in Civil Engineering	M. Chakraborti, Calcutta
03	S.C. Rangwala	Estimating &costing	Charotar Publication
04	B.S. Patil	Civil Engineering Contracts and accounts Vol I,II	Orient Longman,
05	G. S.Birdie	ESTIMATING&COSTING	Dhanpat Rai and Sons

Subject : Advance Structure (Elective-II)
Course code : CIV607
Full Marks : 80+20=100
Hours : 42

Content:

1. **DISPLACEMENT:**

- **Geometric methods:** Deflected shape, Moment area method, and Conjugate beam method.
- **Energy Methods:** Introduction, Form of elastic Strain energy, strain energy in member, energy relations in structural theory, virtual work, Betti's and Maxwell's Law's of reciprocal Deflections, Application of Trusses and Frames, Castiglione's Theorems.

2. **ARCHES:**

Three hinge parabolic arch, Analysis for normal thrust, Horizontal Thrust, Radial shear, Shear force and bending moment.

Two hinge parabolic arch with secant variation of moment of inertia. Analysis for radial shear and normal thrust.

3. **ROLLING LOADS AND INFLUENCE LINES:**

- Introduction, A single concentrated load, Uniformly Distributed load longer than the span, Uniformly Distributed load shorter than span, Two concentrated loads, Series of concentrated loads, Equivalent U.D.L, Influence Lines, influence lines for panelled beam, Influence lines for Truss member, Influence lines for three-Hinged Arches, influence lines from Deflected Shapes, Muller-Breslau's principle, Influence line using Muller-Breslau's principle.

4. **PROPPED CANTILEVER BEAM:**

Analysis by slope and Deflection. Shear force and bending moment diagram, Deflection using consistent deformation and strain energy method. Simple problems.

5. **MATRIX METHOD OF ANALYSIS:**

- Introduction, Axes & co-ordinates, Flexibility & stiffness influence Coefficient, Flexibility Matrix, Stiffness matrix, Relation between flexibility & Stiffness matrices, comparison of methods, System approach of flexibility & Stiffness methods. Transformation of information in structures through matrices. Analysis of continuous beam and orthogonal rigid frames.

Subject : Advance Structure Lab (Elective-II)
Course code : CIV613

List of Experiments

List of Experiments (Any 10 Experiment may be performed)

1. Experiment on a 2 hinged arch for horizontal thrust and influence line for horizontal thrust.
2. Experiment on a 3 hinged arch for horizontal thrust and influence line for horizontal thrust.
3. Experimental and Analytical study of 3 bar pin jointed truss.
4. Experimental verification of Betti's theoremof reciprocal deflections.
5. Experimental verification of Maxwell's laws of reciprocal deflections.
6. Verify the Mulller Breslau theorem by using Begg's deformeter Set.
7. To study the cable-geometry and statics's for different loading conditions.
8. Determination of reflection of Prop Cantilever Beam.
9. Demonstration of Sway in portal frames.
10. ILD for deflection in a steel beam using load method.
11. ILD for support reaction using Muller Breslau principle.
12. Analysis of redundant frame.

REFERENCE BOOKS:

1. Dayaratnam, P. advanced structural analysis, Tata McGraw-Hill Publishing co. ltd., New Delhi, 1978.
2. Junnarkar, S.B., Mechanics of structure vol.II, Charotar Publishing House, anand 1989.
3. Kardestuncer, H., Elementary Matrix analysis of structure, McGraw-Hill Book co., New York 1974.
4. Laursen, H.I., Matrix analysis of structures, McGraw-Hill Book Co., New York, 1966.
5. Martin H.C., Introduction to Matrix methods of Structure analysis, McGraw-Hill Book Co., New York, 1966.
6. Noris, C.H., and Wilbur, J.B., Elementary structural analysis, McGraw-Hill Book Co. New York, 1960.
7. Pandit, G.S., Gupta, S.P, structural analysis-A Matrix approach. Tata McGraw-Hill Publishing Co., New York, 1963.
8. Popov, E.P., Introduction to mechanics of solids, prentice-Hall of India ltd., New Delhi, 1973.
9. Timoshenko, S. and Young, D.H, Theory of structures, second edn., McGraw-Hill Book Co., New York, 1965.

Subject : Water Resources Planning & Management (Elective-II)
Course code : CIV608
Full Marks : 80+20=100
Hours : 42

Content:

OBJECTIVES:

The student is exposed to different phases in Water Resources Management and National Water Policy. Further they will be imparted required knowledge on Reservoir planning, management and economic analysis including Irrigation and Irrigation management practices.

UNIT I

WATER RESOURCES

Water resources survey – Water resources of India – Description of water resources planning – Estimation of water requirements for irrigation and drinking- Single and multipurpose reservoir – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Design flood-levees and flood walls.

UNIT II

WATER RESOURCE MANAGEMENT

Economics of water resources planning; – National Water Policy – Consumptive and non consumptive water use - Water quality – Scope and aims of master plan - Concept of basin as a unit for development -Water budget- Conjunctive use of surface and ground water

UNIT III

IRRIGATION ENGINEERING

Need – Merits and Demerits – Duty, Delta and Base period – Irrigation efficiencies – Crops and Seasons - Crop water Requirement – Estimation of Consumptive use of water.

UNIT IV

CANAL IRRIGATION

Types of Impounding structures: Gravity dam – Diversion Head works - Canal drop – Cross drainage works – Canal regulations – Canal outlets – Canal lining - Kennady's and Lacey's Regime theory

UNIT V

IRRIGATION METHODS AND MANAGEMENT

Lift irrigation – Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation - Merits and demerits – Irrigation scheduling – Water distribution – Participatory irrigation management with a case study

Subject : Water Resources Planning & Management Lab
Course code : CIV614

List of Experiment

1. Integrated water resource management of small area (College campus, small village)
2. Report writing on visit to farm with drip irrigation system and preparing layout plan and neat labelled sketches.
3. Design of sprinkler irrigation system for farm with cost estimated.
4. Study of duty, Delta and Base period of any field.
5. Visit and report of any flood control system.
6. Study and visit of diversion head work of canal.
7. Visit and estimation of storage capacity of multipurpose reservoir.
8. Visit and estimate of capacity of irrigation well and small Pond.
9. Study and estimate of variation of ground water table.

TEXT BOOKS:

1. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000.

2. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009

3. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009

REFERENCES:

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005

2. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGrawHill Inc., New Delhi, 1997.

3. Michael A.M., Irrigation Theory and Practice, 2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, Up, 2008

4. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.

5.Asawa,G.L.,"IrrigationEngineering",NewAgeInternationalPublishers,NewDelhi,2000.

Subject : Earth Quake Resistant Structure
Course code : CIV609
Full Marks : 80+20=100
Hours : 42

Contant-

UNIT: 01 – THE EARTHQUAKES **4 Hrs**

1.01 Earthquakes
1.02 Epicentre, hypocentre and earthquake waves
1.03 Measurement of Ground Motion
1.04 Cause of Earthquake (Plate tectonic)
1.05 Intensity and Isoseismals of an earthquake
1.06 Magnitude and Energy of an earthquake
1.07 Consequences of earthquakes
1.08 Seismic Zoning
1.09 Risk Maps

UNIT: 02 – VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEM **8 Hrs**

2.01 Types of Vibrations
2.02 Degrees of Freedom
2.03 Spring Action and damping
2.04 Equation of motion of single degree of freedom
2.05 Free Vibrations of Undamped systems having single degree of freedom
2.06 Combination of stiffnesses
2.07 Vibration of Damped System having single degree of freedom
2.08 Dry Friction Damping
2.09 Negative Damping
2.10 Forced Vibration of a Undamped System
2.11 Forced vibrations of a damped system
2.12 Equivalent viscous damping
2.13 Vibration isolation
2.14 Vibration Measuring Instruments

UNIT: 03 – BEHAVIOR OF TRADITIONALLY BUILT CONSTRUCTION OF INDIA **4 Hrs**

3.01 Introduction
3.02 Strong motion earthquakes
3.03 Elastic spectra
3.04 Ground velocity and displacement
3.05 Inelastic spectra seismic.

Seismic performance during earth quake and mode of failure (out of plane failure , in plane failure, Diaphragm failure, connection failure, non structural component failure).

UNIT: 04 – ASEISMIC DESIGN OF STRUCTURES **7 Hrs**

4.01 Design data and philosophy of design
4.02 Multi-storey Buildings (G+2) Design-Analysis Design
4.03 Earthquake resistant construction of buildings
4.04 Ductility provisions in reinforced concrete construction
4.05 Base Isolation
4.06 Capacity building Design

UNIT: 05 –MASONRY BUILDINGS **3 Hrs**

5.01 Categories of masonry buildings

5.02 Improving seismic behavior masonry buildings
5.03 Seismic design requirement
5.04 Seismic design of masonry building
5.05 Restoration and strengthening of masonry walls

UNIT: 06 – RAINFORCED CONCERET BUILDINGS **4 Hrs**

Common modes of Failure of Rain forced Conceret buildings
Horizontal & vertical irregularities identifications seismic damage in building
Components (columns, beams, slabs, infill wall, foundation etc.), ductile detailing as per IS13920

UNIT: 07 - IS CODES PROVISIONS RELATED TO EARTHQUAKE **4 Hrs**

Seismic provision of strengthening and retrofitting measure for traditionally built constructions.
Introduction of IS : 4326:1993. IS: 13928:1993 & IS:13927:993 with certain clauses.

Subject : Earth Quake Resistant Structure Lab
Course code : CIV615

List of Practical-

1. Prepare seismic zone mapping of India & world.
2. Prepare Isoseismals of Indian earth quake & Risk map.
3. Preparation of Design Data required for Aseismic design of G+2 Building and their analysis.
4. Prepare design for Ductility provision in G+2 Building taking suitable examples.
5. Prepare drawing (sectional elevation) for Aseismic design of Masonary building limited to single storey, 3 bed room, attached bathroom, front & back veranda with RCC Stair.
6. Sketch design detailing of Reinforcement as per IS:13920 of following items taking suitable size-
   a.) Column with Foundation.
   b.) Slab with Beam.
7. Prepare list for retrofitting measurement of a traditional G+2 building.

Books Recommended:-

01	Earthquake Resistant Design & Analysis	Jai Krishna.
02	Earthquake Resistant Design of Structure	S . K .DUGGAL, Oxford University Press
03	Earthquake Resistant Design of Structure	Pankaj Agrawal, Manish Shrikhande, PHI
04	Dynamic of Structures	A. K. Chopra.
05	IS : 1893-2002; IS : 13920-1993; IS : 13828-1993, IS : 4326-1993	BIS CODES of India
06	Handbook of Earthquake Resistant Structure	Farzard Naim.
07	Dynamics of Structures	Claugh & Penzien.

IIIK-BMTPC Earthquake Tips is a project for twenty four tips of two pages each. Written in simple language. These are available at www.nicee.org for anyone to download. These are very suitable for teachers and Students for polytechnics. Hindi translation of the tips are expected to become available shortly.

Subject : Professional Practices (Common Paper)
Subject Code : 602

Rationale:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Activities to be undertaken:

Students are expected to undertake these activities:

1. Acquire information from different sources (Print and electronic) on the topics of specialization and related to the subjects of II nd and final year. The class is to be divided in groups of not more than five to six students in a group and all groups are to be allotted topic of their choice. The topic should not be repeated to other group for originality of work to be performed by the group. This activity will develop interdependence and leadership among the students.

2. Prepare notes for given topic at point no 1. The notes will be in form of a project report, having all the sections of report. The report should not be of 30 – 50 pages.

3. Prepare presentation and Present the learning and finding on given topic in a seminar. The presentation should be prepared in Power Point module having more than 25 slides. All students should be asked to deal with suitable parts decided by the group itself.

4. Interact with peers to share thoughts. After the final presentation the students should be encouraged to interact with the faculty members, students' fellows and other experts for suggestions and advanced and structured learning.

5. Undertake industrial visit of their area and choice. Prepare a report on industrial visit. Expert lectures on the topic selected may be invited for the students and these expert lectures also the students should be asked to prepare a report and present the same in seminar or have a group discussion before the expert and faculty members.

6. Develop entrepreneurial traits. Students group may be asked to have a field survey and product assessment and analysis for a product of their choice. Prepare a report for all the inputs of their requirement and submit it for evaluation.

7. To prepare for start ups. Expert lectures for exploring this option may be arranged as this is also a viable option and much talked about option for self employment and avail the encouragement by the government.

Based on the above rationales students will advised to develop traits under guidance of dedicated faculty members / mentors.