CURRICULUM

FOR

BACHELOR OF TECHNOLOGY

IN "CIVIL ENGINEERING"

SRI SAI UNIVERSITY PALAMPUR

(H.P.) INDIA

JULY 2012

CONTENTS

Foreword

Sri Sai University Palampur Himachal Pardesh has been established with a purpose of empowering people. The Vision and Mission of the university are:-

- **Vision**

To provide quality education for developing all round personality of students through curricular, co-curricular and extracurricular activities to meet ever growing manpower requirements of industry and other sectors of economy as per national priorities.

- **Mission**

a. To establish institutions for imparting quality education.
b. To promote creative and innovative research and development.
c. To ensure quality education by periodic review of curricula through industry- institute interaction.
d. To make efforts for updating knowledge of faculty/ staff through quality improvement programmes (Training and retraining)
e. To promote employability through development of requisite competency skills.
f. To work for cause of weaker sections, physically challenged and women welfare through education and enlightenment.
g. To make life healthier, better and modern by inculcating in students Indian values/ heritage.
h. To bring about s a holistic development of society by educating individuals.

At present programmes in Civil Engineering, Electrical Engineering, Mechanical Engineering, Electronics & Communication Engineering and Computer Science Engineering are being run here to develop manpower having global perspective, faith in our Indian values and culture and competencies desired for profession. In order to keep curriculum relevant and up to date, the university created a position of 'Director Curriculum Development' supported by Board of Studies of different discipliness. The objective of this is to make teachers and students to become active partners in design of curriculum and instruction.

Director, Curriculum Development has involved Vice Chancellor, Executive Director and senior faculty members of SSU Palampur and Engineering & Technology Colleges at Pathankot and Amritsar in the revision of curriculum . This has created awareness and importance of systematic curriculum design seminar of various programmes and role expected from all the stake holders.

This curriculum has been designed by taking into account incorporating the existing programmes as being run at SSU Palampur and referring to courses of Punjab Technical University, Jalandhar; various IITs; VIT Vellore; Jamia Milia Islamia New Delhi; PEC University of technology, Chandigarh and innovations undertaken by NITTTR Chandigarh in curriculum design.

Hope this Curriculum will being desired results.

Dr Naresh Nagpal

Executive Director

PREFACE

Curriculum is a plan comprising of learning experiences; to be given to students for developing competencies as desired by the 'world of work' in their professional life. Curriculum for SSU programmes has been designed with active involvement of the faculty and other stake holders. This process of designing the curriculum was a unique learning experience for all those involved in the process and understands the meaning and importance of scientific and systematic design of curriculum. A group of teachers provided feedback to the coordinator to up to date Curriculum. This group also scanned employment opportunities and job skills expected from an engineering graduate for inclusion in the curriculum, so as to make it relevant. This resulted in developing in the faculty a sense of ownership due to their involvement in the process.

The steps followed in the design of Curriculum of the degree programme were:

I. Discussions of Director, Curriculum Development with Chancellor, Vice Chancellor and Executive Director regarding their views on Vision and Mission of the University, constraints of programme as well as expectations of Curriculum Development.

II. Orientation programme for senior faculty of SSU to educate them about a rational approach to Curriculum design and to know about their experience of implementing the existing curriculum.

III. Interaction with the faculty from various Institutions to know their view point on their specific discipline, areas of employment, profile of an engineer and curriculum etc.

IV. Analyze the guidelines given by AICTE. ABET and NBA for programme accreditation so as to adhere to the norms and standards for Curriculum of Engineering Degree programmes.

V. Analysis of syllabus and test questions of engineering services examination to ensure that designed curriculum include most of the broad areas and their levels of expectations from fresh graduates.

VI. SSU faculty prepared Horizontal and Vertical organization of subjects of curriculum and learnt about taking decision on various components of Curriculum and their articulation and importance in terms of time. They also understood the logical and chronological placement of subjects in the whole Curriculum.

VII. A workshop was organized at SSCET Pathankot for having understanding of the common features of the programmes; present syllabus being followed at SSU, difference between PTU Curriculum and SSU curriculum and innovation possible in implementation of curriculum.

VIII. Feedback was collected from coordinators of SSU programmes on the aspects given in VII so as to incorporate these in Curriculum document.

IX. Obtain opinion of experts from industry and academic on the proposed curriculum for degree programme in different discipline of Engineering.

X. The curriculum documents were subsequently validated and finalized in consultation with SSU Faculty.

Curriculum provides requisite experiences to students through formal, nonformal and informal activities towards development of occupational, personal, social and continuing learning skills for making students employable. Focus of teachers and students is all the time to active the objective and outcome of the programme stated in the document. Students are made responsible for their learning and teachers become facilitators in this process.

During the design of the curriculum, the constraints of resources of the system in which this curriculum has to be implemented have been considered. It is hoped that with the support of enlightened administration and motivated faculty, innovative methodology will be adopted in teaching-learning process for providing desired learning experiences to the students as stated in curriculum documents.

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DIRECTOR, CURRICULUM DEVELOPMENT
SRI SAI GROUP OF INSTITUTES
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CHANDIGARH-160017

1. SALIENT FEATURES OF THE PROGRAMME

1. Name of the programme	:	B. Tech in Civil Engineering
2. Duration of the programme:	:	4years
3. Entry Qualification	:	12+ Physics, Chemistry and Mathematics
4. Pattern of Programme	:	Semester system (8 Semesters)
5. Duration of the Semester	:	16 weeks
6. Total hours per week:	:	32 to 36 hours
7. Ecological and Environmental	:	Second Semester (2-3) days Awareness Camp and follow up.
8. Entrepreneurship Development Camp and follow up	:	Fifth Semester (2-3)days
9. Industrial Training		*Workshop Practice of 4 weeks during summer vacation after second semester. It will also nclude Industrial exposure/tour also. • Industrial Training of Six weeks duration in summer vacation after fourth semester/survey camp • Industrial Training of six months during seventh / eighth semester.
10. Student centered activity S.C.A will include	:	*library study/ independent study for searching and organization Information for use. • Library study • Market survey • Information search (industry/ in trust) • Seminar • Expert lectures • Camp for ecology & Environmental awareness, entrepreneurship development and personality development.

2. JOB OPPORTUNITIES

SCOPE FOR EMPLOYEMENT

1. Government organization such as PWD, Highways, Railways, Airways, Water Resources M.E.Setc.
2. Construction Companies such as Gammon,L & T, HCL, GMR, SP, ESSAR, TCE etc
3. Research & Development organizations like CBRI,CRRI,CSMRS etc
4 Self Employment as contractor/Builder.
4. Faculty in Engineering colleges

PROGRAMME OBJECTIVES IN CIVIL ENGINEERING

The objectives of the civil engineering programme are to produce graduates who are:

1. Employable in private or government's organization including multinational companies In India as well as abroad, in any of the following fields: foundation, earthwork, and embankment design and analysis; water, waste water, and waste handling and treatment; irrigation, highway design and operation; and structural design and analysis.
2. Possess appropriate leadership skills to lead a group of skilled labor and manage large projects in design, installation and/or maintenance of civilian systems.
3. Academically prepared to pursue licensure as a professional Engineer.
4. Prepared to pursue an advanced education in a variety of disciplines.

3. PROGRAM OUTCOMES FOR B.TECH COURSE IN CIVIL ENGINEERING.

Programme outcomes are defined as capabilities the graduates are expected to have at the time of graduation. They must also lead to attainment of the programme objectives down the road. Some sample outcomes for Civil Engineering are listed here;

a. An ability to apply knowledge of mathematics and science-in the solution of civil Engineering problems.

b. An ability to design and conduct civil engineering experiments and analyze and interpret the resulting data;

c. An ability to design a system, component, or process to meet desired needs within the context of at least two civil engineering areas and considering realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;

d. An ability to function on multidisciplinary teams;

e. An ability to apply knowledge of the environmental, geotechnical, structural ,and transportation areas to the solution of Engineering problems;

f. An ability to identify ,formulate, and solve engineering problems;

g. An understanding of professional and ethical responsibility including the importance of professional licensure;

h. An ability to communicate effectively;

i. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental ,and societal context;

j. A recognition of the need for and an ability to engage in life-long learning;

k. A knowledge of contemporary issues;

l. An ability to use the techniques ,skills and modern engineering tools necessary for engineering practice;

m. An ability to explain the basic concepts in management, business, public policy, and leadership.

4. STUDY AND EVALUATION SCHEME
(FIRST TO EIGHTH SEMESTER)

FIRST SEMESTER

S. No.	Subject Title	STUDY SCHEME			EVALUATION SCHEME		
		Hours/Week			Marks		
		L	T	P	Internal Marks	External Marks	Total Marks
1.1	Mathematics-I	3	1	0	40	60	100
1.2	Chemistry	3	1	--	40	60	100
1.3	Basic Mechanical Engineering	3	1	--	40	60	100
1.4	Applied Mechanics	3	1	--	40	60	100
1.5	Basics of Civil Engineering	3	0	--	40	60	100
1.6	Communication Skill	3	0	--	40	60	100
1.7	Chemistry Laboratory	--	--	2	30	20	50
1.8	Applied Mechanics laboratory	--	--	2	30	20	50
1.9	Workshop Practices	--	--	2	30	20	50
1.10	Communication Laboratory Lab	--	--	2	30	20	50
1.11	Student Centered Activity	--	--	2			
	TOTAL	**18**	**4**	**10**	**360**	**440**	**800**

SECOND SEMESTER

S. No.	Subject_Title	STUDY SCHEME			EVALUATION SCHEME		
		Hours/Week			Marks		
		L	T	P	Internal Marks	External Marks	Total Marks
2.1	Mathematics-II	3	1	--	40	60	100
2.2	Basic Electrical & Electronics Engineering	3	1	--	40	60	100
2.3	Physics	3	1	--	40	60	100
2.4	Computer Programming	3	0	--	40	60	100
2.5	Engineering Graphics	1	0	4	40	60	100
2.6	Principal of Business , Economics and Management	4	0		40	60	100
2.7	Basic Electrical & Electronics Engineering Lab	--	--	2	30	20	50
2.8	Physics Lab	--	--	2	30	20	50
2.9	Computer programming Lab	--	--	2	30	20	50
2.10	Student Centered Activity	--	--	2			
	TOTAL	**17**	**3**	**12**	**330**	**420**	**750**

THIRD SEMESTER

S. No.	Subject_Title	STUDY SCHEME			EVALUATION SCHEME		
		Hours/Week			Marks		
		L	T	P	Internal Marks	External Marks	Total Marks
3.1	Civil Engineering Materials	4	0	--	40	60	100
3.2	Rock Mechanics & Engineering. Geology	3	0	--	40	60	100
3.3	Surveying-I	3	0	--	40	60	100
3.4	Fluid Mechanics	4	1	--	40	60	100
3.5	Solid Mechanics	3	1	--	40	60	100
3.6	Environmental studies	3	1	--	40	60	100
3.7	Surveying Workshop	--	--	3	30	20	50
3.8	Fluid Mechanics Labortory	--	--	2	30	20	50
3.9	Solid Mecha.nics Laboratory	--	--	2	30	20	50
3.10	Workshop Training of 4 weeks duration after second semester	--	--	--	50		50
3.11	Student Centered Activity			3			
	TOTAL	**20**	**3**	**10**	**380**	**420**	**800**

FOURTH SEMESTER

S. No.	Subject_Title	STUDY SCHEME			EVALUATION SCHEME		
		Hours/ Week			Marks		
		L	T	P	Internal	External	Marks
4.1	Building Planning, Drawing and Construction	3	0	2	40	60	100
4.2	Concrete Structure Design – I	4	0	--	40	60	100
4.3	Construction Machinery & Project Planning	3	0	--	40	60	100
4.4	Structural Analysis	3	1	--	40	60	100
4.5	Surveying-II	3	0	--	40	60	100
4.6	Total Quality Management	3	0	--	40	60	100
4.7	Building Construction Lab	--	--	2	30	20	50
4.8	Concrete Lab(RCC)	--	--	2	30	20	50
4.9	Structure Analysis Lab	--	--	2	30	20	50
4.10	Surveying II Lab	--	--	3	30	20	50
4.11	Student Centered Activity	--	--	3			
	TOTAL	19	1	14	360	440	800

FIFTH SEMESTER

Sr. No	Subject Title	STUDY SCHEME			EVALUATION SCHEME		
		Hours/ Week			Marks		
		L	T	P	INT	EXT	TOTAL
5.1	Estimating and Costing	3	1	--	40	60	100
5.2	Geo Technical Engineering	3	2	--	40	60	100
5.3	Design of concrete(RCC) Structure-II	3	2	--	40	60	100
5.4	Environmental Engg I(Water & Waste Engineering)	3	1	--	40	60	100
5.5	Transportation Engg I	3	1	--	40	60	100
5.6	Concrete structure design laboratory	--	--	2	30	20	50
5.7	Transportation Engg Laboratory	--	--	2	30	20	50
5.8	Environmental (Water and Waste Engineering) Laboratory	--	--	2	30	20	50
5.9	Geo Technical Engineering Laboratory	--	--	2	30	20	50
5.10	Estimating and Costing Practical Assignments	--	--	2	30	20	50
5.11	Survey Camp and (Global Positioning System and its application)	--	--	--	40	60	100
5.12	Student Centered Activity	--	--	2			
	Total	**15**	**7**	**12**	**390**	**460**	**850**

SIXTH SEMESTER

Sr. No	Subject Title	STUDY SCHEME			EVALUATION SCHEME		
		Hours/ Week			Marks		
		L	T	P	INT	EXT	TOTAL
6.1	Transportation Engg-II	3	1	--	40	60	100
6.2	Design of Steel Structure-I	3	2	--	40	60	100
6.3	Irrigation (Water Resource Engg)Engg-I	3	1	--	40	60	100
6.4	Foundation Engg and Soil Mechanics	3	1	--	40	60	100
6.5	Elective I	3	--	--	40	60	100
6.6	Open Elective	3	--	--	40	60	100
6.7	Building Planning and Design	--	--	4		50	50
6.8	Concrete Structure Drawing(computer Aided)	--	--	2	30	20	50
6.9	Hydrology and Dams	3	1		40	60	100
6.10	Student Centered Activities	--	--	1			
	Total	**21**	**6**	**7**	**340**	**460**	**800**

Open Elective

- Construction Management and Account
- Repair and Maintenance of Building

Elective 1

- Architecture and Town Planning
- Earthquake Resistant Design
- Prestressed Concrete
- Quantity Surveying and valuation

7th / 8th Semester				
	COURSE TITLE	Marks		
		INT	EXT	TOTAl
	(a)Industrial training with	300	200	500
	(b) Software Training	150	100	250
	TOTAL	450	300	750

SEVENTH/ EIGHTH SEMESTER

Sr. No	Course Title	STUDY SCHEME			EVALUATION SCHEME		
		Hours/ Week			Marks		
		L	T	P	INT	EXT	TOTAL
8.1	Irrigation Engg (Water resource Engg)II	3	1	--	40	60	100
8.2	Design of steel structure-II	3	1	--	40	60	100
8.3	Elective II	3	1	--	40	60	100
8.4	Elective III	3	1	--	40	60	100
8.5	Ground Water Engineering	3	1	--	40	60	100
8.6	Earthquake Resistant Design and Structural Dynamics	3	1	--	40	60	100
8.7	Project	--	--	4	120	80	200
8.8	Irrigation (Water Resource Engg) Lab	--	--	2	30	20	50
8.9	General Fitness	--	--		100		100
8.10	Student Centered Activities	--	--	3			
	Total	18	6	9	490	460	950

Elective II

- Waste Management
- Advanced Construction Material
- Estimating and costing

Elective III

Theory and Application of Geographic Information System
Digital Image Processing

PROJECT

Any one of the following specialization:

- Environment Engg
- Geo Tech Engg
- Transportation Engg
- Hydraulic Structure
- Structural Engg

1. DETAILED CONTENT OF VARIOUS SUBJECTS:

A. FIRST SEMESTER

1.1 Mathematics-I

MODULE-I

Infinite series: Convergence and divergence of infinite series, geometric series test, comparison tests, p-test, ratio test, root test, Raabe's test, Logarithmic test, Gauss test, Alternating series, power series, radius of convergence, interval of convergence

Differential calculus: Partial derivatives, Homogeneous function, Euler theorem, chain rule, change of variables, Partial differentiation of implicit function, Taylor series of two variables, Maximum and Minimum values of function of two variables, Jacobin, Error and increment .curve tracing.

MODULE-II

Solid Geometry: Sphere, tangent plane, orthogonality, Cone, Cylinder, Quadratic surfaces.

Integral calculus: Rectification, quadrature, volume, Surface area of solid of revolution, double and triple integral, order of integration, change of variables, Application of double and triple integral. beta and gamma function.

MODULE-III

Vector calculus: Differentiation of vector, velocity,acceleration, Scalar and vector field, Gradient of scalar field and directional derivatives, Divergence, Curl of vector field, Physical significance, Integration of vector, Line , surface ,volume integral, Stokes theorem, Divergence theorem, green's theorem

Text Books

1. *Advanced Engg.Mathematics ,R.K.Jain,S.R.K.Iyengar Narosa publication*
2. *Higher Engg.Mathematics,B.S.Grewal,Khann publication*
3. *Higher Engg.Mathematics,N.P.Bali,Laxmi Publication*
4. *Advanced Engg.Mathematics,kreyszig,john wiley and sons*

1.2 Chemistry

MODULE I

BASIC CONCEPTS AND WATER TECHNOLOGY: Atomic number, valency, molecular weight, equivalent weight ,morality, normality, how to write a molecular formula.

Water: Structure of water, water as solvent, characteristic properties of water Sources of water, Specifications for water, BOD, COD and DO, Hardness and its determination (EDTA method only), Sewage treatment, Purification of municipal water, Water softening processes – Lime – Soda process, Ion exchange method, boiler feed water, boiler problems-scale, sludge, priming and foaming, caustic mbitterment and boiler corrosion, their causes and prevention, carbonate and phosphate conditioning, colloidal conditioning, calgon treatment, Desalination of water: Reverse osmosis, electro dialysis and multiple effect evaporation. Numerical problems of hardness and Lime-Soda process (7 Hours)

CORROSION SCIENCE: Definition, cause, types and mechanism of corrosion, factors influencing corrosion protective measures against corrosion, metal finishing like electroplating of Au and Cr and electrolessplating of Ni on Al and also preparation of printed circuit board by electrolessplating. (7 Hours)

NON- METALLIC ENGINEERING MATERIALS : (i) Cement : Chemical constitution of Portland cement, functions of different constituents. Theories of the setting of cement. (ii) Abrasives : Introduction, types of abrasives and applications. (7 Hours)

MODULE II

PHOTOCHEMISTRY: Difference between thermo chemical and photochemical rxn., Lambert and beer laws , quantum yield, classification of photochemical rxn, kinetics of some photochemical rxn, Jablonski' s diagram, mechanism of photosensitization, LASER and MASER 7 Hours)

FUELS AND LUBRICANTS : Fuels: Definition, characteristics of good fuel, calorific value: gross and net calorific values and their determination by bomb calorimeter, , Classification of fuels: primary and secondary fuels (7 Hours)

Lubricants: Introduction, friction and wear, Lubricants, mechanism of Lubrications, base oils, additives, greases and emulsions Lubricants :Types of lubrication, fluid film lubrication, boundary lubrication and extreme pressure lubrication. Function of lubricants .Classification of lubricants, solid, semisolid, liquid, emulsions, synthetic lubricants. Conditions for using different types of lubricants. Properties of lubricants.

(7Hours)

MODULE III

Liquid Crystal: Classification of liquid crystals, chemical constitution and liquid crystalline behavior in PAA and MBBA, liquid crystal homologous series, molecular ordering in nematic, smectic and columnar type liquid crystals, identification of liquid crystals using optical microscopy, electro optic properties of liquid crystals, polymorphism in thermotropic liquid crystal and application of liquid crystals(7 Hours)

High Poymers: Definition, classification of polymers, types of polymerization, methods of polymerization, glass transition temp., structure of polymers, plastics, synthesis, properties and applications of few commercial thermoplastic and thermosetting polymers, techniques of plastic moulding, elastomers, adhesive, compounding of resins and plastics, conducting polymers and conduction mechanism in polyacetylene(7 Hours)

Nano-materials: Introduction to nano-materials, Graphite, fullerenes, carbon nanotubes, nanowires, nanocones, Haeckelites. Their electronic and mechanical properties .. Production methods for CNTS. .. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics v) echanics. (5 Hours)

Text Books:

1. *Shashi Chawla "Engg. Chemistry"*
2. *Vasant Gowarikar "Polymer Chemistry"*
3. *Bandyopadhyay A.K., "Nano Materials" ,New age International Publisher*
4. *Palanna "Engg. Chemistry" TMH*

Reference Books:

1. *Misra, G.S., Introductory Polymer Chemistry, New Age International (1993).*

1.3 Basic Mechanical Engineering

First Law of Thermodynamics: Essence and corollaries of the first law, analytical expressions applicable to a process and cycle, internal energy, enthalpy and specific heats, first law analysis of steady flow, applications of steady flow energy equation to engineering devices.

Applications of first law of Thermodynamics: Closed and open systems, analysis of non-flow and flow processes for an ideal gas under constant volume (Isochoric), constant pressure (Isobaric), constant temperature (Isothermal), adiabatic and polytropic conditions. Analysis of free expansion and throttling processes. Representation of these processes on P-V charts and analysis of property changes and energy exchange (work and heat) during these processes.

Second Law of Thermodynamics: Limitations of first law, various statements of second law and their equivalence, application of statements of second law to heat engine, heat pump and refrigerator. Philosophy of Carnot cycle and its consequences. Carnot theorem for heat engines and heat pump. Classius inequality, concept and philosophy of entropy and entropy changes during various processes. Temperature – entropy chart and representation of various processes on it. Third law of thermodynamics.

Simple Stresses & Strains: Concept & types of Stresses and strains, Poisson's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, Elastic constants and their relationships. Temperature stress and strain in simple and compound bars under axial loading, Numerical problems.

Shear Force and Bending Moments Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM and SF and the point of contraflexture under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads. Relation between the rate of loading, the shear force and the bending moments, Numerical Problems.

Bending Stresses in Beams: Bending Stresses in Beams with derivation of Bending equation and its application to beams of circular, rectangular I & T Section, Composite beams,

Torsion of Circular members: Torsion of Solid and hollow circular shafts, Combined bending and torsion, Equivalent torque, Numerical Problems.

Text Books:

1. *Nag, P.K., "Engineering Thermodynamics", Tata McGraw – Hill, New Delhi.*
2. *Yadav, R., Thermal Science and Engineering, Central Publishing House, Allahabad.*
3. *G.H.Ryder "Strength of Materials" Macmillan India.*
4. *Mechanics of Materials – Dr. Kirpal Singh, Standard Publishers Distributors, New Delhi.*

Reference Books:-

1. *Popoy , "Strength of Materials", PHI,*
2. *Sadhu Singh, "Strength of Materials" , Khanna Publications.*
3. *Strength of Materials – A Rudimentary Approach – M.A.Jayaram, , Sapna Book House,*

1.4 APPLIED MECHANICS

1. Basic concepts and fundamental laws, force, moment and couple, resolution and composition of force, system of forces, resultant, Varignon's theorem and law of moments.

2. Lami's theorem, free body diagram, two force and three force members, Equilibrium of forces, equilibrium equations, surface friction.

3. Types of loads, types of supports, analysis of simple and compound beams, virtual work method for support reactions.

4. Centroid, moment of inertia of plane and composite figures, parallel and perpendicular axis theorems, moment of inertia of standard shapes from first principle, moment of inertia of composite figures, radius of gyration.

5. Kinematics of rectilinear motion, motion diagrams for under gravity constant acceleration motion, motion with variable acceleration :

6. Kinetics of linear motion, Newton's Law. De Alembert's principle, work-energy principle, Impulse - momentum principle.

7. Kinematics and kinetics of circular motion, rotation with constant and variable angular acceleration, centripetal and centrifugal force, condition of skidding and overturning.

8. Collision of elastic bodies ; direct central impact, oblique impact, coefficient of restitution, loss of kinetic energy

Text Books:

	Author	Title	Publisher
1.	Beer-Johnson	Engineering Mechanics	Tata McGraw Hill, Delhi
2.	Basu	Engineering Mechanics	Tata McGraw Hill, Delhi
3.	Joseph F. Shelley	Vector Mechanics for Enginerrs Vol. I& II	Tata McGraw Hill, Delhi

1.5 BASICS OF CIVIL ENGINEERING

1. **Introduction to Civil Engineering :** Introduction, branches of civil engineering, application of civil engineering in other allied fields.

2. **Building Planning :**

Principles of planning, orientation of buildings, introduction to Bye-Laws regarding building line, height of building, open space requirements, F.S.I., setbacks, ventilation, sanitation as per municipal corporation area requirement.

3. **Components of Buildings :**

• Sub-structure Types of soil and rocks as foundation strata, concept of bearing capacity, types of foundations i.e. shallow and deep and their suitability. Shallow foundation such as wall foundation, isolated foundation, deep foundation such as pile foundation.

• Super-structure : Elements of super-structures and their functions

4. **Building Design :** Introduction to types of loads, concepts of strength, stability, durability and factor of safety of building, load bearing and framed structures.

5. **Building Materials :** Use and properties of the following materials :

• Concrete – ingredients and grades, plain and reinforced cement concrete and ready mix concrete, bricks, steel, aluminum, plastic, timber, roofing materials etc.

6. Surveying :

• Principles of surveying

• Classification of surveys

- Chain Surveying : Introduction to metric chain and tapes, error in chaining, nominal scale and R.F., ranging, chaining and offsetting, index plan, location sketch and recording of field book

• Chain and compass survey: Meridian, bearing and its types, system of bearing, Types of compass : prismatic and surveyor's compass. Calculation of included angles, correction for local attraction.

7. Levelling :

• Terms used in levelling, use of Dumpy level, temporary adjustments. Methods of reduction of levels, types of levelling, Contours, characteristics of contours, use of contour maps.

• Introduction to Auto level and use

• Introduction and use of EDM's with special reference to Total Station.

• Measurement of area by planimeter – mechanical and digital.

8.**Transportation Engineering :**

• Types of roads : introduction to NH, SH, MDR, ODR, VR, Express Way

• Cross section of road – in cutting and filling

• Railway – Gauges, Cross-section of railway track.

1.6 Communication Skills

MODULE-I

The Process of Communication: Concept and process of communication; Barriers to Communication; Different Types of Communication; Written vs. Oral Communication; Different Types of Face-to-Face Interactions; Characteristics and Conventions of Conversation; Difference between Conversation and Other Speech Events;

Telephone Techniques: Warm Up; Speaking and Listening: Commonly Used Phrases in Telephone Conversations; Reading: Conference Calls; Vocabulary; Writing and Listening: Leaving a Message; Grammar and Usage- The Perfect Tenses; Pronunciation- Contracted Forms.

Job Applications and Interviews: Curriculum Vitae; Language Focus; Some Useful Words; Preparing for an Interview; Listening and speaking in the interview.

MODULE-II

Group Discussions: How to be Successful in a Group Discussion; Study Skills ; Language Focus; Speaking; Case discussions.

Managing Organisational Structure: The Role of a Manager; Leadership; Language Focus; Writing Reports; Pronunciation.

Meetings: A Successful Meeting; Speaking: One to One Meetings; Language Focus: Opening, Middle and Close; Editing; Criteria for Successful Meetings; Reporting Verbs; Memos

MODULE-III

Taking Notes and Preparing Minutes: Taking Notes- The Essential Components, Preparing Minutes- Format of Minutes, Language and Style of Minutes, Grammer.

Presentation Skills : Presentation Skills; Importance of Body Language in Presentations; pronunciation; Structure of presentation; Visual Aids; Ending the presentation; Podium Panic Pronunciation: Emphasizing the Important Words in Context

Negotiation Skills: Idiomatic Expressions; Process of Negotiations; Phrasal Verbs; Listening: Effective Negotiations; Speaking; Writing.

Technical Report Writing: Objective; Planning; Language; format of the report and guidelines for a good report writing with illustrations of good writing.

Practice Sessions: Students should be asked to prepare and present seminars during the practice session. Group discussions and case discussions should also be used and feedback given to students.

Text Books:

1. *The Chicago Manual of Style, PHI*
2. *Gowers, Ernest, "The Complete Words". Penguin, 1973.*
3. *IEEE Transactions on "Written and Oral Communications" has many papers of relevance*
4. *Ludlow, R., and Panton, F., "The Essence of Effective Communication", PHI*

1.7Chemistry Laboratory

LABORATORY WORK

List of Experiments:-

1. Preparation and standardization of solutions: NaOH, HCl, H_2SO_4 and Oxalic acid
2. To determine the hardness of water sample by EDTA method. (ALL)
3. To determine the acidity of water sample.
4. To determine the amount of residual chlorine in water sample.
5. To determine the total cation conc. In natural water sample using ion exchange resin.
6. To determine COD of a effluent sample.
7. Estimation of rate of corrosion of aluminium in acidic and basic medium.
8. Calorimetric determination of Copper.
9. Verification of Beer's law
10. To determine the surface tension of a liquid using drop no. method.
11. To determine the viscosity of the given liquid by Redwood viscometer.
12. To determine the acid value of the given oil.
13. To determine flash point and fire point of a lubricating oil
14. To determine the mol. Wt. Of polystyrene by viscosity measurements.
15. To determine melting point and/or glass transition temperature of a polymer.
16. .To prepare the pure and dry sample of Urea Formaldehyde resin.
17. To prepare the copper ammonia complex
18. Preparation of nano-oxide using combustion method
19. .Estimation of moisture and ash content in a given sample of coal.

1.8 APPLIED MECHANICS LABORATORY

List of Experiments:-

1 (a)Parallelogram law of forces.
(b) Triangle law of forces
© Polygon law of forces
2. To verify the forces in different members of a Jib crane.
3. To verify the reaction at the spot of a simply supported beam.
4. To find the Mechanical Advantage, Vel Ratio and efficiency in case of an inclined plane.
5. To find the MA,VR and efficiency of a screw jack.
6. To find the MA,VR,Efficiency of worm wheel.
7. To find MA,VR and efficiency of first & second system of pulleys.
8. To find out the CG of regular lamina.

1.9 WORKSHOP PRACTICES

Relevant shop floor exercises involving practice in pattern making, Sand casting, Machining, Welding, Sheet metal fabrication techniques, Fitting work and surface treatment of metals, Demonstration of Forge welding, TIG/MIG/GAS/Spot/Flash butt welding, Demonstration on Shaper, Planer and Milling machine.

1.10 COMMUNICATION LABORATORY

Teacher should give following Assignments to students to develop skills of communicating effectively:

- communication cycle(with the help of Diagram)
- Communication Situation (List of 5 Communication situation stating the type of communication.
- Barriers that hinder a particular communication situation.(state the type of barrier, and how to overcome them)
- Developing a story or a paragraph for the given tiopic sentence (in a group of 5-6 students)
- Describing various equipments.
- Identifying the various sentences with their types of writing(e.g. Scientific , legal, colloquial etc.)
- Business letters
- Letters of suggestion
- Comparative Time Table of 2 students
- Description of two different person.
- Letter to the Librarian, Principal
- Report writing.

B. SECOND SEMESTER

2.1 Mathematics-II

MODULE-I

Linear Algebra: Rank, Linear Independent and Dependent, system of liner equations, Eigen values and Eigen vector, Cayley Hamilton theorem, diagonalization, linear transformation, quadratic form and Reduction to canonical form. Complex matrices.

Complex Numbers: De-Movire's theorem and its application, Elementary function of complex variable, Summation of series.

MODULE-II

Function Of Complex Variable: Analytic function, Harmonic functions, Necessary and sufficient condition for the function w= f(z) to be analytic, Application of analytic function in flow problem, complex integrations, Cauchy's integral theorem, Cauchy's integral formula, Cauchy's integral formula for derivatives, Power series, Taylor's and Laurent's series, Zero's & singularities of complex function, Evaluation of real integral using residues, Bilinear transformation and conformal mapping

MODULE-III

Ordinary Differential Equation: Formation of differential equation, Exact differential equation, equation of first order and higher degree equation, Claurit's equation, Linear differential equation , Bernoulli's equation, Linear differential equation with constant coefficient, Method of variation of parameter, Method of undetermined coefficient, Cauchy and Legendre equation , simultaneous differential equation, application of linear differential equation.

Partial Differential Equations And Its Applications: Formation of P.D.E , Lagrange equations, Charpit method, Higher order linear differential equation with constant coefficient.

Text books:

1. *Simmons, G.F., Differential Equations (With Applications and Historical Notes ,TMH*
2. *Jain,.R.K, .Iyengar "Advanced Engg.Mathematics" , Narosa publication*
3. *Grewal B.S,"Higher Engg.Mathematics",.,Khanna publication*
4. *Kasana, H.S., Complex Variables: Theory and Applications, PHI*

Reference Books:

1. *Kreyszig Erwin, Advanced Engineering Mathematics, John Wiley (2006*
2. *Ram Babu, Engineering Mathematics, Pearson Education (2009).*
3. *Higher Engg.Mathematics,N.P.Bali,Laxmi Publication*
4. *Advanced Engg.Mathematics,kreyszig,john wiley and sons*

2.2 BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Introduction: Basic electrical quantities, Electric circuit sources and circuit elements and their behavior (Active and passive).

Supply Systems: AC Supply system (Single phase, Three phase–three wire, Three phase–four wire), DC supply system, Their specifications and Comparison. D.C. Networks: Mesh and Nodal Analysis, Star–Delta Transformation, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Step voltage response of RL and RC series circuits.

Sinusoidal Steady-State Response of Circuits: Concept of Phasors, Phasor representation of circuit elements, Complex notation representation, Series and parallel circuits, Power and power factors, Resonance in series and parallel circuits, Balanced 3–phase voltage, Current and power relations, 3–phase power measurement.

Magnetic Circuits: Concept of Magnetic circuits, B–H curve, Calculation of Magnetic Circuits, Iron Losses.

Single–Phase Transformers: Constructional feature, EMF equation, Ideal transformer, Open and short circuit tests, Voltage regulation and efficiency.

Rotating Electrical Machines: Construction, Operating principles and Applications of DC generator, DC motor, Three phase Induction motor and Single phase induction motors.

Electrical safety and Wiring: Electrical safety and standards, House hold wiring and electric appliances.

Energy Management: Conservation efforts, Auditing.

Electronic Devices: P–N diode, BJT, SCR, FET, MOSFET, Their V–I characteristics and applications (Diode as rectifier, Zener diode as voltage regulator).

Text Books:-

1. *Smith, I.M., Hiley, J. and Brown, K., Electrical and Electronic Technology, Dorling Kingsley.*
2. *Nagrath, I.J. and Kothari, D.P., Basic Electrical Engineering, TMH*
3. *Naidu, M.S. and Kamashaiah, S., Introduction to Electrical Engineering, TMH*

Reference Books:

1. *Chakrabarti, A., Basic Electrical Engineering, TMH*
2. *Del Toro, V., Electrical Engineering FundamentalsPHI*
3. *Sawhney A. K . "A Course in electrical and electronic Measurements & Instumentation" Dhanpat Rai & co*

2.3 PHYSICS

MODULE – I

L**ASER:-**Basic concept of Laser, maser, principle of Laser action Population Conversion pumping its types its types. Types of Laser, Solid, gas and , Semiconductor and its application. Holography & its applications.

Optical Fibers:-Basic Principle of Optical fibre, characteristic of Optical fibre. Numerical aperture, graded Index, Step Index, its relation with Δ, propagation of light in Optical fibre. energy loss during propagations (dispersion), optical communication, through free space, wave guide, its applications.

MODULE – II

Special Theory of relativity: Postulates of specialtheory of relativity, Michelson Morley Experiment, Lerentz Transformation, Length Contraction, Time dilation, addition velocity Relativity of mass Energy equivalence.

Quantum Mechanics: Need of quantum Mechanics**,** De brogile wave phase & group velocity, particle diffraction uncertainty principle, the wave equation, postulates of Quantum mechanics. Time dependent and independent schrodinqer equation, Expectation values, Eigen value, eigen function, particle in a one dimensional box Finite potential well, Harmonic oscillator.

Quantum Statistics: Fermions & Bosons Symmetric & antisymmetric wave functions, Boltzman distribution functions, Base distribution & Fermi distributions function, Comparison of the distributions, Applications of base distribution function specific heat of solid Base-Condensation, Applications of Fermi-distribution functions, Free Electron gas thermionic emission.

MODULE – III

Superconductivity & Magnetism: Basic concept of superconductor, Meissner effect, type I & II superconductors, London equation, BSC Theory, Thermodynamic properties of superconductor Josephson Effect, flux equatization squid, orbital magnetic dipole moments orbital g-factor, magnetic dipole in uniform magnetic field, Electron spin magnetic properties of solid, diamagnetic Theory of para magnetic, susceptibility, Ferro magnetic, Antiferro Magnetic & Ferrimagnetism.

Electro Magnetism: Quantization & conservation of charge, Coulomb's Law, concept of Electric flux, Electric potential conductors, Capacitors, & dielectric materials, magnetic field, Force on a moving charge in a magnetic field, force on current Element, torqueon current Loop, Biot Savart Law, Amphere's Law, Electromagnetic Induction & Faradays Law, Magnetism in materials Maxwell equations, Divergence, gradient & Curl and Significance.

TextBooks:

1. *Beiser, A., Concept of Modern Physics, TMH*
2. *Griffiths, D.J., Introduction to Electrodynamics, PHI*
3. *Kittel, C., Introduction to Solid State Physics, Wiley,*
4. *Thyagarajan K & A K Ghatak, Lasers, , Macmillan India Ltd. Banglore.*
5. *Gerd Keiser Optical Fibre Communication, TMH*
6. *Arora C.L. Practical Physics, S. Chand & Co.*

Reference Books:

1. *Rao, C.K, Optical Fibre System, Mc Graw Hill.*
2. *Sirohi R.S., Practical Physics, R.S. Sirohi, Wiley Eastern.*
3. *Modern Phusics, H.C.Ohanian, Prentice Hall.*

2.4 COMPUTER PROGRAMMING

Introduction: Elements of computer processing, Hardware and software, Introduction and feature wise comparison of various Operating Systems, Including DOS, Windows and Linux, Problem solving-algorithms and flowcharts.

C Programming Basics: Basic program construction, Structure of a C program, Compilation process. Various compilers available on different OS/ environments including Turbo C, Borland C, gc, gcc, MSVC. Console I/O (printf, scanf), preprocessor directives, Comments, Data types, Type conversions, Operators - arithmetic, Relational, Logical, Conditional, Increment/decrement, Library functions, Header files.

Loops and Decision Statements: *for* loop, *while* loop, *do* loop, Various forms of *if* statement, *switch* statement, *break* statement, *continue* statement, *goto* statement, arrays and strings, Declaring an array, Initializing arrays, Accessing the array elements, Working with multidimensional arrays, Declaring and initializing string variables, Arithmetic operations on characters, String handling functions (string.h), Pointers, Pointers to pointers, Declaring and initializing pointers, Pointer expressions, Pointer increment and scale factor, Pointers and arrays, Pointers and strings.

Functions: Defining functions, Passing arguments to functions, Returning values from functions, Reference arguments, Variables and storage classes, Static functions, Pointers and functions.

Structures and Union: Declaring and initializing a structure, Accessing the members of a structure, Nested structures, Array of structures, Using structures in functions, Pointers and structures, Declaring and initializing a union.

Files: Reading and writing to text and binary files, Character I/O, String I/O, File pointers, Error handling, Redirection, Command line arguments.

Structured Programming vs. Object Oriented Programming.

Text Books

1. *KernighanBrian W. and Ritchie, Dennis M, The C Programming language, Dorling Kingsley(2008) 2nd ed.*
2. *Balagurusamy, E., Programming in Ansi C, TMH.*

Reference Books:

1. *Stroustrup, Bjarne, The C++ Programming Language,. Addison Wesley*
2. *Kanetkar, Yashavant, Let Us C, BPB*

2.5 ENGINEERING GRAPHICS

Introduction: Use of drafting tools, Lettering, Dimensions and Standards, Line Conventions.

Projection Systems: Projection Planes, Projection systems, Orthographic projections of points in first angle projection system and third angle projection system, Orthographic projections of lines on reference planes, True length of line using rotation of view method, Traces of lines, Auxiliary planes and their applications, Projections of Lamina parallel/inclined to reference planes, Projection of solids- Polyhedra, Solids of revolution, Sections of solids- Section plane parallel / inclined to reference planes, Intersection of solids.

Development of Surfaces: Development of surfaces like Prism, Pyramid, Cylinder, Cone, Sphere etc. using Parallel Line Method, Radial Line Method, Triangulation method.

Orthographic Projections: Extracting Orthographic projections from given pictorial views.

Isometric Views: Extracting Isometric projections from given Orthographic views using box method, Offset method.

Missing Lines and Missing Views: Evaluating missing lines and missing views from given orthographic views.

Computer Aided Drafting: Introduction to computer drafting tools like AutoCAD. Demonstration of commands like Line, Circle, Arc, Rectangle, MText and Dimensioning etc.

Text Books:

1. *Gill, P.S., Engineering Drawing - Geometrical Drawings, S.K. Kataria*
2. *Mohan, K.R., Engineering Graphics, Dhanpat Rai Publishing Company*

Reference Books:

1. *French, Thomas E., Vierck, C. J. and Foster, R. J., Fundamental of Engineering Drawing & Graphics Technology, McGraw Hill Book Company*
2. *Bhatt, N.D. and Panchal, V.M., Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House*

2.6 PRINCIPLES OF ECONOMICS & MANAGEMENT

MODULE-I

Economics: Definitions, Nature & scope of Economics, Economics Systems-meaning of Capitalism, Socialism & mixed economy.

Demand And Supplies Analysis: Law of demand and supply, exception to the law of demand, Elasticity of demand and supply and their types, Methods of measuring elasticity of demand and supply.

Theory of Production: Scales of production, Law of returns, Break even analysis.

Monetary System: Monetary Policy – Meaning, objectives, methods, Fiscal policy – Meaning & objectives of fiscal policy in a developing country like India, Functions of Reserve Bank of India and commercial banks.

MODULE-II

Economics & Business Environment: Privatization –Growth of private capitalism in India, Business/Trade Cycles – Meaning, Characteristics & classification, foreign capital & economic development.

Management Principles: Meaning & types of Management, Concept of Scientific Management, Management by Objectives, System Approach to Management.

Financial Management: Meaning, functional areas of financial management, Sources of Finance, Meaning of financial accounting, accounting principles-concepts & conventions, Importance of final accounts – profit & loss a/c and balance sheet, Need and importance of capital budgeting.

MODULE-III

Marketing Management: Introduction to marketing management, Market segmentation, Developing & managing advertising programs, Deciding on media & measuring effectiveness.

Production Management: Procedure for production planning & Control, Plant Location & Lay-out, Routing, Scheduling, CPM & PERT

Quality Management: Statistical Quality Control, introduction Control Charts, X Charts, R Charts, Control Charts for C (N. of defects per unit), Control chart for P(Fraction defective), Advantages & Limitations of SQC, Quality Circles:- Structure, functions & Limitations.

Text Books:

1. Dewett , K.K., Modern Economic Theory , S.Chand & Co
2. Singh. P. and Habra, T. N., Business Organization & Management, Dhanpat Rai & Sons
3. Kotler, Philip., Marketing Management, PHI
4. I.M. Pandey., Financial Management, Vikas Publishing House Pvt. Ltd.

Reference **Books:**

1. Ruddar Dutt, K.P.M.Sundaram., Indian Economy, S.Chand & Co.
2. Ahuja, H.L, Advanced Economic Theory, S.Chand & Co.
3. Grant, Leaven worth, Statistical Quality Control ,TMH
4. Edwin B.Flippo, Personnel Management , TMH
5. Koontz Harold, Management – A Global Perspective, TMH

2.7 BASIC ELECTRICAL & ELECTRONICS ENGG LABORATORY

LABORATORY WORK

Kirchhoff's laws, Network theorems, A.C. series and parallel circuits, Resonant circuit, Measurement of power 3–phase circuits, Reactance calculation of variable reactance choke coil, Tests on transformers, Starting methods of DC motor, Three phase induction motor and single phase induction motor, Identification and testing of devices (R,L,C, Diode and Transistor), V–I Characteristics of P–N diode, Zener diode , BJT as amplifier, Use of diode as half wave and full wave rectifier.

2.8 PHYSICS LABORATORY

LABORATORY WORK

List of Experiments

1. To find the frequency of A.C. mains using Electric Vibrator.
2. To determine the resistivity & Hall coefficient of a Semi Conductor by four probe method at different temperature.
3. To study the variation of magnetic field of a circular coil Carrying current I & Calculate the radius of coil.
4. To study the divergence of a Laser beam.
5. To determine the wave length of Laser using diffraction grating.
6. Determine the numerical aperture of an optical fibre.
7. To determine attenuation and propagation Lasses in optical fibre.
8. Making up the hologram using advanced Laser hit.
9. To find the susceptibility of ferro magnetic material (Fecl3) by quince Method.
10. To study Laser interference using Michelson Morley Interferometer
11. To study the photovoltaic cell & hence to verify the inverse square law.
12. To convert a galvanometer into an ammeter of a given range.
13. To find the value of plank's constant by using a photo electric cell.
14. To find the Low resistance by Carry Foster's Bridge.
15. To fine the temperature coefficient of resistance by using platinum resistance thermometer by bridge.

2.9 COMPUTER PROGRAMMING LABORATORY

LABORATORY WORK

Introduction to Hardware - CPU, Storage devices & media, VDU, I/O Devices.Basic Operating System (DOS/UNIX) commands. Simple programs to demonstrate the use of constants, Variables, printf, scanf and operators. Programs using Loops: Solution of quadratic equation, Summation of finite series, Fibonacci series, Prime numbers, Factorial. Menu driven programs using switch statement. Use of continue and break statements, Conditional operators. Passing variables to functions by values and by reference, Number conversion using array, Sorting, Merging, Arithmetic operations on matrices. String manipulation: Comparing, Copying, Reversing , Finding length, Extracting characters. Simple programs demonstrating the concept of Pointers, Passing values to functions using pointers for arrays, Structures. Creating various types of records using structures. Storing and retrieving records from a file, Copying a data file. Randomly accessing a record, Use of command line arguments.

C. THIRD SEMESTER

3.1 CIVIL ENGINEERING MATERIALS

Bricks: Composition of good brick earth, harmful ingredient, manufacture of bricks, characteristics of good bricks, shapes, losis, classification of bricks as per IS 1077-1985.

Stones: Classification of rocks, test for stones, characteristics of a good building stone, deterioration of stones, common building stones of India, comparison of the brick comparison of the brick work and stone work.

Cement: Manufacture, basic properties of cement compounds, grades, packing storage, quality control and curing, supplementary cementatious materials such as fly ash, rice husk ash, silica fume.

Aggregates: Classification, characteristics, soundness of aggregates, fineness modulus, maximum size of aggregate and grading of aggregates.

Admixtures and Superplasticizers: Functions, classification, accelerating admixture, retarding admixture, air-containing admixtures, waterproofing and permeability reducing admixture, corrosion inhibiting admixtures and coloring admixture.

Lime & Mortar: Classifications & Properties.

Concrete: Introduction, properties of concrete, water cement ratio, workability, compressive strength, grades, Production of Concrete: Batching, mixing, transportation, placing, compaction and curing of concrete, quality control of concrete, concrete mix design. Special Concretes: RMC, Shortcrete.

Timber: Classification and identification of timber, defects in timber, characteristics of good timber, seasoning of timber and its methods, preservation of timber, varieties of industrial timber, famous Indian timber tress, Plywood.

Metals: Manufacture of steel, market forms of steel e.g. mild steel and HYSD steel bars, rolled steel sections. Thermo Mechanically Treated (TMT) Bars, Brief discussion of properties and uses of aluminum.

Miscellaneous Materials: Epoxies, Asbestos, Asphalt, Bitumen, insulating materials, materials for doors and windows, paints, varnishes, white washing, distempering, materials for structural repairs, cracks and joint fillers.

Engineering Services: Water supply and electrical system, Sewerage and disposal of refuse, Acoustics and sound proofing, Ventilation and air-conditioning, Lift and escalators.

Fire: Fire hazards, fire fighting system means of escape alarms system, Fire prevention measures.

Text Books:

1. *Gambhir, M.L., Concrete Technology, TMH*
2. *Rangwala, S.C., Engineering Materials, Charotar Publishing House*

Reference Books

1. *Kumar, Sushil, Engineering Materials, Metropolitan Press.*
2. *Kumar, Sushil, Building Construction, Standard Publishers Punmia,*
3. *B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Building Construction, LPH*

3.2 ROCK MECHNAICS & ENGINEERING GEOLOGY

GEOLOGY OF INDIA

Earthquakes: Definition, terminology, causes, earthquake waves, intensity, recording of earthquakes, seismic zones in India, factors to be considered and methods in earthquake proof construction.

Earth movements: Landslides and land subsidence, elementary idea about classification, factors causing landslides and land subsidence. Preventive measures for landslides viz retaining walls, slope treatment, chemical stabilization and drainage control.

Engineering Properties of Rocks and their Laboratory Measurement: Uniaxial compression test, tensile test, permeability test, shear test, effect of size, shape of specimen, rate of testing and confining pressure; stress strain curves for typical rocks. Strength of intact and fissured rocks. Effect of anisotropy, influence of un-saturation and temperature on strength. In-situ determination of

Engineering Properteis of Rock Masses : Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear tests, pressure tunnel test.

Simple methods of determining in-situ stresses: Bore hole over coring technique, Bore hole deformation gauges. Improvement in Properties of Rock masses by Pressure grouting for dams and tunnels, rock reinforcement and rock bolting.

LIST OF PRACTICALS:

1. Study of minerals-hand specimens.
2. Study of rocks-hand specimens.
3. Field description of rocks for engineering practices.
4. Study of elements of symmetry and Crystal systems with crystal models.
5. Study of Geological Maps.
6. Dip and strike problems.
7. Study of optical properties of minerals.

Note: - The subject will be treated with special reference to Indian Conditions. A conducted / guided tour through representative geological formations will be planned as a compulsory part of the course covering Stratigraphical, Structural and Petro logical aspects.

3.3 SURVEYING-I

Introduction And Chain Surveying : Definition, Principles, Classification, Field and office work – Precision and Accuracy, Scales, Conventional signs, Survey instruments, Ranging and chaining, Reciprocal ranging, Setting perpendiculars, well , conditioned triangles, Traversing, Plotting, Enlarging and reducing figures.

Compass Surveying And Plane Table Surveying: Prismatic compass, Surveyor's compass, Bearing, Systems and conversions – Local attraction , Magnetic declination, Dip, Traversing, Plotting , Adjustment of error , Plane table instruments and accessories , Merits and demerits , Methods , Radiation, Intersection, Resection , Traversing.

Levelling : Level line , Horizontal line, Levels and Staves, Spirit level, Sensitiveness, Bench marks, Temporary and permanent adjustments, Fly and check levelling, Booking, Reduction, Curvature and refraction, Reciprocal levelling, Longitudinal and cross sections, Plotting, Calculation of areas and volumes , Contouring , Methods , Characteristics and uses of contours , Plotting , Earth work volume , Capacity of reservoirs.

Theodolite Surveying : Theodolite, Vernier and microptic, Description and uses, Temporary and permanent adjustments of vernier transit, Horizontal angles, Vertical angles, Heights and distances, Traversing, Closing error and distribution, Gale's tables, Omitted measurements

Survey Applications : Reconnaissance, preliminary and location surveys for engineering projects, Lay out – Setting out works , Route Surveys for highways, railways and waterways , Curve ranging – Horizontal and vertical curves , Simple curves , Setting with chain and tapes, tangential angles by theodolite, double theodolite , compound and reverse curves , Transition curves – Functions and requirements , Setting out by offsets and angles , Vertical curves , Sight distances – Mine Surveying , instruments , Tunnels , Correlation of under ground and surface surveys , Shafts , Adits.

Text books:

1. *Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation,*
2. *Punmia B.C. Surveying, Vols. I II and III, Laxmi Publications,*

ReferenceBooks:

1. *Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S.*
2. *James M.Anderson and Edward M.Mikhail, Introduction to Surveying, McGraw Hill ,*

3.4 FLUID MECHANICS

Fluid statics: Basic equations, pressure and its relationship with height, pressure diagram, hydrostatic forces on submerged bodies, buoyancy and floatation, liquids in relative equilibrium.

Fluid kinematics: Flow characteristics, continuity equation, acceleration of fluid particles, rotational and irrotational motion, circulation and vorticity, velocity potential and stream function, streamlines, equipotential lines, flow net - method, use and limitations.

Fluid dynamics: Euler's equation, energy equation and Bernoulli's equation, application of Bernoulli's equation orifice meter, venture meter, pivot tube etc., flow through orifice, mouth piece, weir and notches, impulse momentum equation and its application, pipe junction, bends, stationary flat and curved vanes, moment of momentum equation.

Flow through pipes: Reynolds' experiment, laws of fluid friction, Darcy Weisbach equation, energy losses, equivalent pipe, pipes in series and parallel, branched pipes, time of emptying a reservoir through pipe, pipe networks.

Laminar flow: Laminar flow through circular pipes, parallel plates, open channel, Porous media, couette flow, Stokes law, measurement of viscosity, transition from laminar to turbulent flow.

Dimensional analysis and similitude: Dimensional homogeneity, Non Diomensional parameter, Π theorem, dimensional analysis chice of variables, Reyleigh methods, examples Rise in capillary tube, head characteristics of a pump, drag on a ship, Fall velocity of a sphere, velocity in an open channel, pipe orifice, discharge over a sharpedge weir, celerity of a gravity wave. Model analysis similitude, types of similarities, force ratios, similarity laws, model classification, scale effects.

Boundary layer theory: Types, boundary layer thickness and equations, momentum integral equation boundary layer on rough surfaces, total drag on flat plate due to laminar and turbulent boundary layer, boundary layer separation and its control.

Turbulent flow: Shear stresses, establishment of flow, types of boundaries, mixing length concept, velocity distribution, mean velocity and resistance to flow in smooth and rough pipes, friction in non circular conduits.

Flow measurement: Measurement of pressure- static, dynamic and total pressure, Piezometric head, Measurement of velocity- Pitot tube and prandtll tube. Measure flow through orifice, mouth piece, weir and notches, measurement of discharge-orifice, mouthpiece weir and notches, orifice meter, Flow nozzle, Venturi flume.

Flow through open channels: Classification of flow, Uniform flow, Prismatic and non prismatic channel, Hydraulically efficient channel cross sections, specific energy, specific energy curves, critical flow in rectangular channels.

Turbines and pumps: Brief description of types and working of turbines and pumps.

Text ***Books:-***

1. *Douglas JF, Gasiorek JM, Swaffield JP, Fluid Mechanics; Pitman*
2. *Streetes VL & Wylie EB; Fluid Mechanics : McGraw Hill book company.*
3. *Kumar D.S; "Fluid Mechanics and Fluid Power Engineering" S.K.Kataria*
4. *Garde R.J. and A.G.Mirajgaoker "Engineering Fluid Mechanics", Nem Chand & Bros,*
5. *Garde R.J. "Fluid Mechanics through Problems" Wiley Eastern Ltd,*

Reference Books:-

1. *Subramanya, K., Theory and Application of Fluid Mechanics, Tata McGraw Hill*
2. *Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House*
3. *Asawa G.L , Experimental "Fluid Mechanics" vol-I,, Nem Chand & Bros*
4. *Bansal R.K, Fluid Mechanics & Hydraulic Machines :*
5. *Massey B. S, "Mechanics of fluid ", Van Nostrand Reinhold Co.*

3.5 SOLID MECHNICS

Axial Stress and Strain: Concept of stress and strain, Generalized Hooke's law, Stress-strain diagram of ductile and brittle materials, properties of engineering materials, Statically determinate and indeterminate problems, Compound and composite bars, Thermal stresses.

Torsion of Circular shafts: Basic assumptions, Torsion formula, Power transmitted by shafts, Design of solid and hollow shafts based on strength and stiffness.

Shear Force and Bending Moment Diagrams: Types of load on beam, Classification of beams, Shear force and bending moment diagrams: Simply supported, Overhung and Cantilever beams subjected to any combination of point loads, Uniformly distributed and varying load and moment, Relationship between load, shear force and bending moment.

Theory of Pure Bending: Derivation of flexural formula for straight beams, bending stress calculation for beams of simple and built up sections, Flitched beams.

Shear Stresses in Beams: Shear stress formula for beams, Shear stress distribution in beams.

Stability of Columns: Crippling load of an axially loaded columns under different end conditions, Euler's and Rankine's formula.

Deflection of Beams: Governing differential equation for deflection of straight beams having constant flexural rigidity, double integration and Macaulay's methods for slopes and deflection, Moment area method, Conjugate beams method.

Analysis of Plane Stress and Strains: Transformation equations for plane stress and plane strain, Mohr's stress circle, Relation between elastic constants, Strain measurements, Strain rosettes.

Theories of Failure: Theories of elastic failure, graphical comparison of theories of failure.

Text ***Books:***

1. *Popov, E.P. and Balan, T.A., Engineering Mechanics of Solids, PHI*
2. *Singh, D.K., Mechanics of Solids, Pearson Education*

ReferenceBooks-

1. *Shames, I. H. and Pitarresi, J. M., Solid Mechanics, PHI*
2. *Crandall, S.H., Dahl, N.C. and Lardner., An Introduction to Mechanics of Solids, MH*

3.6 ENVIRONMENTAL STUDIES

Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness

Renewable and non-renewable resources: Natural resources and associated problems- a) Forest resources : Use and over-exploitation, deforestation, case studies; Timber extraction, mining, dams and their effects on forest and tribal people; b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems; c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies; d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies; e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles**.**

Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers; Energy flow in the ecosystem. Ecological succession.Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: (a). Forest ecosystem; (b) Grassland ecosystem; (c) Desert ecosystem; (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries**.**

Biodiversity and its conservation: Introduction – Definition : genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. Inida as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity - habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity - In-situ and Ex-situ conservation of biodiversity.

Environmental Pollution: Definition, Cause, effects and control measures of :- Air pollution; Water pollution; Soil pollution; Marine pollution; Noise pollution; Thermal pollution; Nuclear hazards and solid waste Management : Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.. Pollution case studies. Diaster management : floods, earthquake, cyclone and landslides.

Social Issues and the Environment: From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rahabilitation of people; its problems and concerns. Case Studies;Environmental ethics : Issues and possible solutions;Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution)

Act; Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

Human Population and the Environment: Population growth, variation among nations; Population explosion – Family Welfare Programme., Environment and human health; Human Rights. Value Education; HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health. **(6 lectures)**

Field work : Visit to a local area to document environmental assets river/forest/ grassland/hill/ mountain; Visit to a local polluted site-Urban/Rural/Industrial/Agricultural; Study of common plants, insects, birds; Study of simple ecosystems-pond, river, hill slopes, etc. (**Field work = 5 lecture hours)**

(**NOTE**: Syllabus for Environment Studies includes class room teaching and Field Work. The syllabus is divided into eight units covering 50 lectures. The first seven units will cover 45 lectures which are class room based to enhance knowledge skills and attitude to environment. Unit eight is based on field activites which will be covered in five lecture hours and would provide student first hand knowledge on various local environmental aspects. Field experience is one of the most effective learning tools for environmental concerns. This moves out of the scope of the text book mode of teaching into the realm of real learning in the field, where the teacher merely acts as a catalyst to interpret what the student observes or discovers in his/her own environment. Field studies are as essential as class work and form an irreplaceable synergistic tool in the entire learning process.)

Text Books:

1. *Mhaskar A.K., Matter Hazardous, Techno-Science Publication*
2. *Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. Clark R.S., Marine Pollution, Clanderson Press Oxford*
3. *Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication*
4. *Agarwal, K.C. Environmental Biology, Nidi Publ. Ltd. Bikaner.*

ReferenceBooks:

1. *Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)*
2. *Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. Environmental Encyclopedia, Jaico Publ. House, Mumabai,*
3. *De A.K., Environmental Chemistry, Wiley Eastern Ltd.*

3.7 SURVEYING WORKSHOP

LABORATORY WORK

1. **Chain And Compass Surveying :**Ranging and Chaining – Offsets - Traversing.
2. **Plane Table Surveying:** Radiation – Intersection – Resection – Traversing
3. **Levelling:** Study of levels and levelling staff - Fly levelling using Dumpy level and Tilting level – Check Levelling.
4. **Theodolite Surveying:** Study of theodolites - Measurement of angles by reiteration and repetition - Measurement of vertical angles.

3.8 FLUID MECHNICS LABORTORY

LABORATORY WORK

List of Experiments

1. To determine the meta-centric height of a ship model
2. Verification of Bernoulli's theorem
3. To calibrate a venturimeter and to determine its coefficient of discharge
4. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number
5. To study the flow over v notch (weir) and to find the coefficient of discharge
6. To determine the hydraulic coefficient of discharge of a mouth piece.
7. To verify the momentum equation experimentally
8. To determine the coefficient of friction of pipes of different diameters.
9. To determine the form losses in a pipe line
10. To obtain the surface profile on the total heads distribution of a forced vortex
11. Viscous flow analogy (Hele-Shaw apparatus) for flow net.
12. Electrical analogy for flow net.
13. Study of flow measurement devices through rotameter apparatus

3.9 SOLID MECHNICS LABORTORY

LABORATORY WORK

Tests for Hardness, Bending, Impact, Tensile strength, Torsion and Compression tests.

List Of Experiments:-

1. Rockwell/Brinell hardness number of given specimens.
2. Vicker's hardness number test.
3. Torsion test (destructive): to determine the torsional rigidity of the material.
4. Tensile test on strip/universal testing machine – to obtain the young's modulus of elasticity, tensile strength and percentage elongation of the material.
5. Impact strength of the given material – Izod's and Charpy tests.
6. Experimentally determine the value of E of the beam material using deflections formula for cantilever and simply supported beams.
7. Non-destructive torsion test to determine modulus of rigidity of the shaft material.
8. To study the behavior of the material on UTM.

C. FOURTH SEMESTER

4.1 BUILDING PLANNING, DRAWING AND CONSTRUCTION

Brick & Stone Masonry: Terms used; types of bonds; their merits and demerits; Rubble and ashlar joints in stone masonary, introduction to cement concrete hollow blocks, advantages and disadvantages of concrete block masonry over brick masonry.

Walls and Foundation: Load bearing and non-load bearing walls,estimation of load on walls and footings, Thickness considerations, partition and cavity walls design of masonry walls, pillars and footings.

Damp Proofing: Sources, Causes of dampness in buildings, bad effects of dampness, methods of damp proofing.

Arches and Lintels: Introduction to terms used in Arches; different types of arches; brick and stone arches, types and functions of lintels.

Roofs: Introduction, terms used, types of roof trusses and roof coverings, details of rain proofing, rain water pipes.

Doors and Windows: Introduction, terms used, location of doors and windows, types of doors and windows, methods of fixing doors and window frames in walls. Ventilators.

Plastering, Pointing and Painting: Introduction, objects and types, special materials for plastered surfaces, distempering, white washing and color washing of plastered surfaces.

Floors: Introduction, various types of floors commonly used and their suitability for different buildings, constructional details of concrete ant Terrazzo floorings, marble flooring, anti- termite treatment.

** Site Selection criteria. Principles of Building planning. Significance Sun diagram. Wind Diagram.

H-Orientation, Factors affecting, criteria under Indian condition. Building Planning Byelaws & regulations as per SP-7, 1983 National Building code of India group 1 to 5. Planning of Residential Building (Bungalows, Row Bungalows, Apartments and Twin Bungalows) Procedure of Building Permission, significance of commencement, plinth completionor occupancy certificate. Low cost Housing-Materials & Methods (conceptual introduction only) HMaintenance, Repairs, Rehabilitation of Structures. (conceptual introduction only)

Drawing No. 1

Details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick apron have to be shown in the drawing.

Drawing No.2

Plans of ‘T’ and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond

Drawing No. 3

Elevation, sectional plan and sectional side elevation of flush door, panelled door with wire gauge shutter. Sketches of various joints of different members

Drawing No. 4: (2 sheet)

Drawing plan, elevation of a one room building from the given site plan, the foundation detail and sectional elevation.

Text Books:

1. *S.K. Sharma Building Construction*
2. *Sushil Kumar Building Construction*

Reference Books:

1. *B.C. Punmia Building Construction*

4.2 CONCRETE STRUCTURE DESIGN-I

Introduction: Reinforced concrete, definition, properties of materials, grades of concrete and reinforcing steel, stress-strain curves, permissible stresses, concrete structural systems-slabs, beams, columns and foundations, design philosophies working stress design, ultimate strength and limit state design method.

Introduction to Working Stress Design Method: *Design for flexure*: Assumptions, derivation of design constants, problems on computation of moment of resistance, determination of stresses, and design of rectangular beams reinforced in tension and compression, flanged beams and slabs. *Design for shear and bond and torsion*: Permissible shear strength, maximum shear strength, shear reinforcement and design procedure for shear reinforcement, bond and development length, anchoring and curtailment of bars. *Design for Compression:* Design of short and long columns, sections subjected to direct load and uniaxial bending.

Limit State Design Method: Introduction, Limit States, Characteristic values, characteristic strength, characteristic loads, design values for materials and loads, factored loads. Limit State of Collapse (Flexure) Types of failures, assumptions for analysis and design of singly reinforced, doubly reinforced sections, and flanged sections. Limit State of Collapse (Shear, bond and torsion) Introduction - Design for shear, structural components subjected to torsion, design of rectangular beam section for torsion, development length, continuation of reinforcement (beyond cut off points). Limit State of Collapse (Compression) Columns and their classification, reinforcement in columns, assumptions, short and long (both tied and helical) columns subjected to axial load, short columns subject to axial, uniaxial and biaxial bending. Limit State of Serviceability Deflection, effective span to effective depth ratio, modification factors for singly reinforced, doubly reinforcement and flanged beams, crack formation and its control.

Limit State Design of various elements and miscellaneous structures: Design of Rectangular and Flanged beams, Design of Lintels, Design of one-way slabs and two-way rectangular slabs, Circular slabs: Slabs with different edge conditions, Design of columns, Interaction Diagrams, Design of isolated footings.

Application of SP 16 and Detailing of Reinforcement: Use of SP: 34, Codal Provision for RC Elements: (I) General (II) for ductility.

Text Books:

1. *Gambhir, M.L., Fundamentals of Reinforced Concrete Design, Prentice Hall of India (2009).*
2. *Jain, Ashok. K., Reinforced Concrete Limit State Design, Nem Chand Brothers (2007).*
3. *Ram Chandra, Limit State Design, Standard Book House (1990).*

Reference Books:

1. *Pillai, Sunnikrishnan and Menon, D., Reinforced Concrete Design, TMH*
2. *Varghese, P.C., Limit State Design of Reinforced Concrete, PHI*
3. *Sinha, S.N. and Roy, S.K., Fundamentals of Reinforced Concrete, S. Chand*

4.3 CONSTRUCTION MACHINERY & PROJECT PLANNING

INTRODUCTION : Need for project planning & management, value engineering , time value of money, activity & event, bar chart, Milestone chart, uses & draw backs.

PERT : Construction of PERT network, time estimates, network analysis, forward pass & backward pass, slack, critical path, data reduction, suitability of PERT for research project, numerical problems.

CPM : Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance in project control, numerical problems.

COST ANALYSIS AND CONTRACT : Type of costs, cost time relationships, cost slopes, conducting a crash programme, determining the minimum total cost of project, flexible budgets, cost & quality control, profit planning control & decision making, cost accounting systems, numerical problems. Updating a project, when to update, time grid diagram, resource scheduling planning of different components of civil engineering projects such as a house, workshop, dam, tunnel.

EARTH MOVING MACHINERY : Tractors, bull dozers, rippers, scrappers power shovels, dragline, hoes. Line diagram of each, sizes, output, uses, factors affecting selection of each equipment, economic life of equipment maintenance and repair cost. Hoisting & Transporting Equipments: Hosts, Winches, Cranes, Belt conveyors, Ropeways, trucks & Wagons.

CONSTRUCTION EQUIPMENT : Plants for grading, batching, mixing, types of mixers, concrete pumps, bitumen plants.

Text Books:

1. *Peurifoy R.L. , Construction Planning and Equipment, TMH*
2. *Srinath L. S , PERT and CPM, East West Press*

Reference Books:

1. *Wiest & levy , Management Guide to PERT & CPM , PHI*
2. *Mahesh Verma, Construction Equipment & Planning and Application.*
3. *W Stubbes Jr., Hand book of Heavy Construction*

4.4 STRUCTURAL ANALYSIS

Analysis of Determinate Structures: Revision of analysis of plane trusses, Analysis of pin jointed space trusses using tension coefficients and equilibrium equations.

Displacements: Energy Methods: Strain energy in members, Betti's and Maxwell's Laws of reciprocal deflections, Concept of Virtual work and its applications, Castigliano's theorems, Unit load method, Deflections of trusses and 2D-frames.

Indeterminate Structures: Introduction, Static and kinematic indeterminacies, Stability of structures, Internal forces in two and three-dimensional structures.

Analysis of Indeterminate Beams and Frames: Classical Methods: Methods of consistent deformation, Method of least work, and Theorem of three moments; Conventional methods of Analysis of rigid frames: Slope deflection method, Moment distribution method; Approximate methods: Portal method, and Cantilever method.

Moving Loads and Influence Line Diagrams: Bending moment and shear force diagrams due to single and multiple concentrated rolling loads and uniformly distributed moving loads, Equivalent UDL, Muller Breslau principle**:** Influence lines for beams, Girders with floor beams and frames calculations of the maximum and absolute maximum, shear force and bending moment envelopes.

Influence lines for Indeterminate Structures: Influence lines for bending moment, shear force and reactions for continuous, balanced cantilever beams and rigid frames using elastic theorems.

Analysis of Typical Structures: Three hinged and two hinged arches, influence lines for thrust, radial shear and bending moment.

Text Books:

1. *Wang, C.K., Indeterminate Structural Analysis, McGraw Hill (1983).*
2. *Norris, C.H., Wilbur, J.B. and Utku, S., Elementary Structural Analysis, McGraw Hill*

ReferenceBooks:

1. *Dayaratnam, P., Advanced Structural Analysis with matrix applications, TMH*
2. *Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, S.M.T.S.2 Theory of Structures, Laxmi Publications*

4.5 SURVEYING -II

Tacheometric Surveying: Tacheometric systems - Tangential, stadia and subtense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - Fixed and movable hairs – Stadia constants - Anallactic lens - Subtense bar. **(6 hours)**

Control Surveying: Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line - Instruments and accessories - Corrections - Satellite station - Reduction to centre – Trignometrical levelling - Single and reciprocal observations - Modern trends. **(8 hours)**

Survey Adjustments: Errors - Sources, precautions and corrections - Classification of errors - True and most probable values - weighted observations - Method of equal shifts - Principle of least squares - Normal equation - Correlates - Level nets - Adjustment of simple triangulation networks. **(8 hours)**

Astronomical Surveying: Celestial sphere - Astronomical terms and definitions - Motion of sun and stars – Apparent altitude and corrections - Celestial co-ordinate systems - Different time systems – Nautical almanac - Star constellations - Practical astronomy - Field observations and calculations for azimuth**. (11 hours)**

Miscellany: Electromagnetic distance measurement - Carrier waves - Principles – Instruments - Trilateration – Total Station - GPS Surveying - Hydrographic Surveying - Tides - MSL - Sounding and methods - Location of soundings and methods - Three point problem – Strength of fix - Sextants and station pointer - River surveys - Measurement of current and discharge - Cadastral surveying - Definition - Uses - Legal values - Scales and accuracies. **(12hours)**

***Text Books*:**

1. *Singh, Narinder, Surveying, TMH*
2. *Kanetkar, T.P., and Kulkarni, S.L., Surveying and Leveling Part I and II, Pune Vidhyarthi Griha Prakashan*

Reference Books:

3 *Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I and II, LPH*

4 *Agor, R., Surveying, Khanna Publishers (1982).*

4.6 TOTAL QUALITY MANAGEMENT

Introduction to quality management: Definitions – TOM framework, benefits, awareness and obstacles. Quality – vision, mission and policy statements. Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality. Cost of quality.

Principles and philosophies of quality management: Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi techniques – introduction, loss function, parameter and tolerance design, signal to noise ratio. Concepts of Quality circle, Japanese 5S principles and 8D methodology.

Statistical process control and process capability: Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed. Process capability – meaning, significance and measurement – Six sigma concepts of process capability. Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve.Total productive maintenance (TMP) – relevance to TQM, Terotechnology. Business process re-engineering (BPR) – principles, applications, reengineering process, benefits and limitations.

Tools and techniques for quality management: Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation. Seven old (statistical) tools. Seven new management tools. Bench marking and POKA YOKE.

Quality systems organizing and implementation: Introduction to IS/ISO 9004:2000 – quality management systems – guidelines for performance improvements. Quality Audits. TQM culture, Leadership – quality council, employee involvement, motivation, empowerment, recognition and reward- Introduction to software quality.

Text Books:

1. *Dale H.Besterfield et al, Total Quality Management, Third edition, Pearson Education*

4.7 BUILDING CONSTRUCTION LABORTOARY

Skills to be developed:

Intellectual skills:- students will be able to

a) Identify component of a building
b) Differentiate and identify types of building materials
c) Select appropriate material for building construction
d) Supervise the building construction activities.

Motor skills:- student will be able to.

a) Mark layout of building on the ground
b) Check and mark various levels in building.

List of Practicals:

1. Preparing foundation plan and marking on ground layout of load bearing structure by face line method from the given plan of the building.
2. Preparing foundations plan and marking on ground layout of framed structure by face line method from the given plan of the building.
3. Checking and transferring lines and level of plinth, sill, lintel, flooring, slab level of a building and writing report of the process.
4. Checking vertically (plumb line) of formwork for column, beam and wall at construction site and writing report of the process.
5. Laying and constructing the process of construction of brickwork and report writing of the process.
6. Observing the process of painting in residential/ public building and writing a report with reference to process and type of paint selected.
7. Observing and writing report of the process of plastering.
8. Observing and writing report of the process of water proofing of terrace or basement.
9. Observing the model, specimen of building materials kept in the model room for few building items and writing a report for any five models/ materials.

4.8 CONCRETE LABORTOARY(RCC)

The following experiments are to be performed in the Concrete Lab.

1. To Determine the Specific Gravity of cement.
2. To Determine the Standard Consistency, Initial and Final Setting Times of Cement.
3. To Determine Soundness of Cement.
4. To Determine the Compressive Strength of Cement.
5. To Determine the Compressive Strength of Bricks/Tiles.
6. To Determine the Fineness Modulus of Fine and Coarse Aggregates.
7. To Determine the Bulk Density, Water Absorption and Sp. Gr. of Fine and Coarse Aggregates.
8. To Determine the Slump, Compaction Factor and Vee-Bee Time of Concrete.
9. Mix Design of Concrete.
10. To Determine the Compressive Strength of Concrete by Cube and Cylinder.
11. To carry out the Tensile and Flexural tests of Concrete.
12. To determine the Compressive Strength of hardened Concrete by Non-Destructive Test

Books/Manuals :-

1. Concrete Manual By Dr. M.L. Gambhir, Dhanpat Rai & Sons Delhi.
2.Concrete Lab Manual by TTTI Chandigarh

4.9 STRUCTURE ANALYSIS LABORTOARY

LABORATORY WORK

List of Experiments:-

1. To verify Betti's Law.
2. To find the deflection of a pin connected truss.
3. To determine the flexural rigidity (E1) of a given beam.
4. To verify Moment-Area Theorems for slope and deflection of a beam.
5. To study the behavior of different types of struts.
6. To determine the loads in three suspension rods supporting an elastic beam.
7. To obtain experimentally the influence line for the horizontal thrust in a two hinged arch.
8. To determine the elastic displacement of curved members.
9. To determine the horizontal displacement of the roller end in a curved beam.
10. To make computer programs for theoretical verification of the above experiments.

4.10 SURVEYING II LABORTOARY

LABORATORY WORK

List of Experiments:-

1. Setting out works - Foundation marking - Simple curve (right/left-handed) – Transition curve.
2. Theodolite Traversing
3. Heights and Distances – Triangulation problem – Single plane method
4. Tachometry - Tangential system - Stadia system - Sub tense system.
5. Field observation on SUN to calculate azimuth.
6. Experiments on Total Station – GPS.
7. Study of Micro Optic Theodolite - Digital Theodolite.

E. FIFTH SEMESTER

5.1 ESTIMATING AND COSTING

Overview of Estimating &Costing

Meaning of the terms estimating, costing, purpose of estimating and costing.

- Types of estimate- Approximate and Detailed.

Approximate estimate types- plinth area rate method, Cubic Content method, Service unit method. Typical bay method, Approximate Quantity method, problems on plinth area rate method & application of service unit method for selection of service unit for application of service unit method for selection of service unit for different types of civil Engineering Structures.

- Types of detailed estimate.
- Detailed estimate for new work
- Revised estimate.
- Supplementary estimate.
- Revised & Supplementary estimate.
- Maintenance & repair estimate.
- Uses of detailed estimate

Detailed Estimate

- Unit quantity method, Total quantity method, Data required for detailed estimate. Factors to be considered during preparation of detailed estimate, specification, Quantity availability of material, Location of site, Labour Component.
- Steps in preparing detailed estimate. Taking out quantites, squaring, abstracting.
- Preparing check list- by adoption of sequence of execution. Drafting Brief specification of items, contents of measurement sheet, Abstract sheet, face sheet.

Mode of Measurements.

- General Rules for fixing units of Measurements for different items of work as per IS 1200 & as per PWD hand book.
- Desired accuracy in taking Measurement of various items of work & rules for deductions as per IS 1200 & P.W.D hand book.

Procedure for Preparing Detailed Estimate

- Procedure for taking out quantities for various items of works by P.W.D 7 IS 1200 for.
    - a) For load bearing Structure – Long wall and short wall method, Center line method.
    - B) Framed Structure building.
  - By using thumb rules for reinforcement quantity calculation.
  - By preparing bar bending Schedule.
- 4.2 Provisions in detailed estimate for contingencies, Work charged establishment, Provisional items, Provisional sum, Provisions for water supply & Sanitary works, Electrical wiring installations, sent age charges, tools & Plants, Prime cost, Day work.

Rate Analysis

- Meaning of term rate analysis – Factors affecting rate analysis lead, lift task work materials and labour components, Market rate and Labour rate.
- Transportation of Materials, load factor for different materials. Standard lead, Extra lead Transportation charges, Labour – Categories of labours, labour rates, overheads, contractors profit, water charges, taking out quantities of materials for different items of works.

- Preparing rate analysis of different items of work
- Standard Schedule of rates, Full rates & labour rates.

Taking Out Quantities of work for different Civil Engineering Works

- Roads, Dam, Canals, Railway embankments, methods of mean area, Mid section area, Trapezoidal, Prismoidal formula. Calculation of Quantity of earth work.

Learning resources:

Text Books:

	Title	Author	Publisher
1	Estimating & costing in Civil Engineering	B.N Datta	USB Publishers Distributors Pvt Ltd New Delhi
2	Estimating & costing, Specification and Valuation in Civil Engineering	M. Chakraborti	M. Chakraborti, Calcutta
3	Estimating & costing	S.C. Rangwala	Charotar Publication Anand
4	Civil Engineering Estimating, contracts and accounts Vol.1	B.S Patil	Orient Longman, Mumbai
5	Estimating & Costing	G.S. Birdie	Dhanpat Rai and Sons Delhi

5.2 GEO TECHNICAL ENGINEERING

1. Basic Concepts: Definition of soil and soil mechanics common soil problems in Civil Engineering field. Principal types of soils. Important properties of very fine soil i.e. adsorbed water, Base Exchange and soil structure. Characteristics of main Clay mineral groups i.e. montmorilonite, illite and kaollite, Basic definitions in soil mechanics. Weight volume relationship theory and determination of specific gravity from picnometer test. Field denesity from sand replacement method and other methods.

2. Index Properties: Grain size analysis. Stock's law and Hydrometer analysis. Consistency and sensitivity Clay as per I.S. Code Atterberge Limits Flow Index and Toughness Index. Underlying theory of shrinkage limit determination. Classification of coarse grained soils. Classification of fine-grained soils as per Indian standard classification system (IS-1498-1970).

3. Compaction: Definition and object of compaction and concept of O.M.C. and zero Air Void Line. Modified proctor Test. Factors affecting compaction Effect of compaction on soil properties and their discussion. Field compaction methods- their comparison of performance and relative suitability. Field compacative effor. Field control of compaction by proctor.

4. Consolidation: Definition and object of consolidation difference between compaction and consolidation. Concept of various consolidation characteristics i.e. av, mv and cv primary and secondary consolidation. Terzaghi's Differential equation and its derivation Boundary conditions for Terzaghi's solution for one dimensional consolidation concept of cv, tv & U. consolidation test determination of cv from curve fitting methods, consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over-consolidation. Effect of disturbance on e-Log sigma curves of normally consolidated clays, importance of consolidation settlement in the design of structures.

5. Permeability and Seepage: Concept of effective stress principal, seepage pressure, critical hydraulic gradient and quick sand condition. Capillary phenomenon in soil. Darcy's Law and its validity, seepage velocity, co-efficient of permeability and its determination in the laboratory. Average permeability of startified soil mass, factors affecting 'K' and brief discussion.

6. Shear Strength: Stress analysis of a two dimensional stress system by Mohr circle. Concept of pole. Coulomb's law of shear strength coulomb - Mohr strength theory. Relation between principal stesses at failure. Direct, triaxial and unconfined shear strength tests. Triaxial shear tests based on drainage conditions typical strength envelopes for clay obtained from these tests. Derivation of skempton's pore pressure parameters. Stress strain and volume change characteristics of sands.

7. Earth Pressure: Terms and symbols used for a retaining wall. Movement of all and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium and derivations of expressions for Ka and Kp for horizontal backfills. Rankine's theory both for active and passive earth pressure for Cohesionless backfill with surcharge and fully submerged case. Cohesive backfill condition. Rankine's Earth pressure for a cohesionless backfill with sloping surface (with proof) concept of active and passive Earth pressure on the basis of stability of a sliding wedge. Coulomb's method for cohesion less backfill. Merits and demerits of Ranking and Coulomb's theories graphical construction and Rebhan's graphical construction (without surcharge load).

Text Books:

1. Soil Mech. & Foundation Engg, by K.R.Arora
2. Geotechnical Engineering, by P. Purshotama Raj
3. Soil Mech. & Foundation Engg., by V.N.S.Murthy

5.3 DESIGN OF CONCRETE (RCC) STRUCTURE – II

1. Introduction to earth quake resistant design, intensity & Magnitude on lateral force analysis and basic concepts of seismic design as per IS-1893

2. Assumptions made in theory of RCC. Principle of design of flexural members by working stress and Limit State Methods.

Note: All design and analysis using Limit State Method for following topics.

3. Analysis of beams: Moment of Resistance of singly, doubly and flanged beams, Design of continuous beams.

4. Analysis of shear, bond and torsion.

5. Analysis of one and two way slabs, Design of flat slabs, Design of continuous slabs

6. Calculation of cracking and deflection for Limit State of Serviceability.

7. Design of axially and eccentrically loaded columns.

8. Design of Stair case.

Text Books:

1. Design of Reinforced Concrete Structures P. Dayaratnam

2. Reinforced Concrete Fundamentals Fergnson

3. Design of Concrete Structures Nilson and Winter

4. Reinforced Concrete Structural Elements Purshothaman
Behavior, Analysis and Design

5. Reinforced Concrete Design Pillai & Menon

6. Limit State Design Ramachandra

7. Limit State Design A.K. Jain

8. Limit State Design of Reinforced Concrete P.C. Vergese

9. Earthquake Resistant design of structures by Pankaj Aggarwal & Manish Shikahande-PHI Publications.

10. Earthquake Design concept by CVR Murthy & Andrew Charleson published by Nicee-IIT Kanpur

5.4 ENVIRONMENTAL ENGINEERING-I (Water & Waste Engineering)

1. **PUBLIC WATER SUPPLY:** Beneficial uses of water, water demand, per capita demand, variation in demand; causes, detection and prevention of wastage of water, population forecasting.

2. **SOURCES OF WATER SUPPLY:** Surface and underground sources, relation and development of source in r/o quality and quantity of water, Development of wells, Storage reservoir-balancing and service storage, capacity determination by mass curve method. Intake and transmission system distribution systems: network design.

3. **QUALITIY AND EXAMINATION OF WATER:** Necessity for examination of water impurities in water, sampling of water, physical, chemical and bacteriological quality for domestic water supply. Drinking water quality standards and criteria.

4. **WATER SUPPLY AND DRAINAGE OF BUILDINGS**: System of water supply houses connections, matering, internal distribution, and sanitary fittings pipe joints, Different types of pipes and pipes materials.

5. **WATER TREATMENT:** Unit operations in water treatment screening, sedimentation, and its theory sedimentation aided with coagulation, flocculation, sand filtration-slow, rapid, gravity and pressure filters, Disinfecting, Necessary: requirements of disinfectant, methods, of disinfecting different practices of chlorinating.

6. **MISCELLANEOUS METHODS OF WATER TREATMENT:** Aeration, taste and odour control iron and manganese removal water softening processes Base exchange process, Swimming pool water Treatment

TextBooks:

1. Water Supply Engineering Environmental Engg. I by B.C. Punmia, Ashok Jain, Arun Jain.
2. Environmental Engineering - A Design Approach by ARCADIO P. SINCERO, GREGORIA A. SINCERO
3.Environmental Engineering and Technology, by PEAVY,ROWE.

5.5 TRANSPORTATION ENGINEERING I

1. Introduction: Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport.

2. Highway Development & Planning: Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys.

3. Highway Alignment: Requirements, Alignment of Hill Roads, Engineering Surveys.

4. Highway Geometric Design: Cross Section Elements, Carriageway, Camber, Sight Distances, Horizontal Curves, Extra-widening, Super-elevation, Vertical Curves.
5. Highway Materials: Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials.
6. Highway Construction: Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements.
7. Highway Drainage: Importance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas.
8. Highway Maintenance: Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures.
9. Highway Economics & Financing : Total Transportation Cost, Economic Analysis, Sources of Highway Financing.
10. Traffic Characteristics : Road User Characteristics, Driver Characteristics, Vehicular Characteristics
11. Traffic Studies: Volume and Speed Studies, O-D Survey, Parking Study
12. Traffic Safety: Cause and Type of Accidents, Use of Intelligent Transport System
13. Traffic Control Measures: Signs, Markings, Islands, Signals
14. Traffic Environment Interaction: Noise Pollution, Vehicular Emission, Pollution Mitigation Measures

Text Books:

1. Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers, Roorkee, 1998.
2. Kadiyali, L.R. “Principles and Practice of Highway Engineering”, Khanna Publishers, New Delhi, 1997.
3. Flaherty, C.A.O. “Highway Engineering”, Volume 2, Edward Arnold, London, 1986.
4. Sharma, S.K. “Principles, Practice & Design of Highway Engineering”, S. Chand & Company Ltd., New Delhi, 1985.
5. Khanna S.K., and Justo, C.E.G. “Highway Material Testing Laboratory Manual”, Nem Chand and Brothers, Roorkee, 1997.

5.6 CONCRETE STRUCTURE DESIGN LABORTOARY

LABORATORY WORK

List of Experiments:-

- Design of a concrete mix in accordance with IS and ACI guidelines.
- Determination of flexural strength of concrete.
- Determination of split tensile strength of concrete.
- Plotting of stress-strain curve of given concrete mix and to determine the modulus of elasticity.
- Plotting stress-strain curve of mild steel and HYSD bars.
- Behaviour of following RCC beams subjected to flexure

(a)Under - reinforced beam. (b)Over - reinforced beam. (c) Balanced Section.

- Behaviour of RCC beams in shear.
- Effect of partial replacement of cement by fly ash on properties of concrete.

9) Demonstration of Non-destructive testing equipment like Impact Hammer, Ultrasonic Pulse Velocity Tester, Profometer, Corrosion analyser and Resistymeter.

5.7 TRANSPORTATION ENGINEERING LABORTOARY

1. Tests on Sub-grade Soil
    - IS Compaction Test
    - California Bearing Ratio Test

2. Tests on Road Aggregates
    - Gradation Test
    - Crushing Value Test
    - Abrasion Value Test
    - Impact Value Test
    - Specific Gravity & Water Absorption Test
    - Shape Test
    - Marshal Stability Test
3. Tests on Bituminous Materials
    - Penetration Test
    - Ductility Test
    - Softening Point Test
    - Flash & Fire Point Test
    - Bitumen Extraction Test

4. Field Tests
    - Roughness Measurements of Road by Profilograph

Recommended Books:

1. Khanna S.K., and Justo, C.E.G. “Highway Testing Manual”, Nem Chand and Brothers, Roorkee, 1998.

5.8 ENVIRONMETAL(Water & Waste) ENGINEERING LABORTOARY

1. To measure the PH value of a sample
2. To find the turbidity of a given sample
3. To find B.O.D. of a given sample
4. To measure D.O. of a given sample
5. Determination of Hardness of a given sample
6. Determination of total solids, dissolved solids, suspended solids of a given sample
7. To determine the concentration of sulphates in water/wastewater sample.
8. To find chlorides in a given sample
9. To find acidity/alkalinity of a given sample
10. To determine the COD of a wastewater sample.

Text Book:

1. Environment Engg. Chemistry by Sawyer & Macarty.
2. Standard Methods of examination of water & wastewater APHA, AWWA, WEF

5.9 GEOTECHNICAL ENGINEERING LABORTOARY

1. Determination of in-situ density by core cutter method.
2. Determination of in-situ density by sand replacement method.
3. Determination of Liquid Limit & plastic Limit by Casagrande apparatus and penetrometer method.
4. Determination of specific gravity of soil solids by pyconometer method.
5. Grain size analysis of a given sample of sand and determination of coefficient of uniformity and coefficient of curvature.
6. Direct shear and triaxial test on a given soil sample.
7. Unconfined compression test for fine grained soil.
8. Determination of permeability by constant Head Methods and variable head method.
9. Compaction test (proctor) and modified proctor test.
10. Plot of zero air voids line.
11. Determination of Relative Density of soil.

Text Books:

Soil Testing Engineering, Manual By Shamsher Prakash and P.K. Jain.

5.10 Estimating and Costing Practical Assignments

List of Assignments:

1. Prepare Check list of items of following type of Civil Engineering works

a) Load Bearing type Building
b) Framed structure type building
c) W.B.M.road
d) Septic Tank
e) Community well

2) Writing the rules of deduction,s for below mentioned items of work as per IS 1200

a) Brick/ Stone masonry
b) plastering/Pointing

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

a) Earth work in excavation for foundation
b) Base Concrete of foundation
c) U.C.R/BB Masonry work in foundation and plinth.
d) D.P.C.
e) Plinth filling.
f) Brick work in masonry.
g) Flooring
h) Plastering
i) Wood work in doors and windows.

4) taking out quantities of following items for small R.C.C.Hall.

a) Concreting for footing, Column, BEAM, Slab.
b) Reinforcement for above items by preparing schedule of bars.
c) Form work for all above items.

5) Preparing detailed estimate of a RCC single and two storied residential building for all items of work(The quantity of reinforcement shall be calculated by percentage)

6)preparing rate analysis of following items: Building work-Brick work,P.C.C.,R.C.C., Plastering, Flooring, Doors, windows.

7) taking out quantities of earth work for a road profile prepared in surveying subject.prepare the lead statement.

8) taking out quantities of work for a community well or jack well or septic Tank.

9) Takink out quantities of work for pipe culvert.

5.11 SURVEY CAMP and (Global Positioing system and its Application)

The students will be required to make a topographic map of an undulating hilly terrain measuring about 250 acres. The work will be as under:
Reconnaissance, selection of main stations, measurement of horizontal and vertical angles, measurement of base line, determination of R.L. of main station by double levelling from B.M., measurement of bearing of any one line, computation of coordinates of station points, plotting of details, interpolation of contours.

I. The duration of survey camp is of 4 weeks.

F. SIXTH SEMESTER

6.1 TRANSPORTATION ENGINEERING II

1. Introduction to Railway Engineering: History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways.
2. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge.
3 Railway Track: Requirements of a Good Track, Track Specifications on Indian Railways, Detailed Cross-Section of Single/Double Track on Indian Railways.
4 Components of Railway Track: Rails, Sleepers, Ballast, Subgrade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.
5. Geometric Design of Railway Track: Alignment, Gradients, Horizontal Curve, Super-elevation, Equilibrium Cant, Cant Deficiency, Transition Curves.
6. Points and Crossings: Functions, Working and Design of Turnout, Various types of Track Junctions and their layouts, Level-crossing.
7. Railway Stations & Yards: Site Selection, Classification & Layout of Stations, Marshalling Yard, Locomotive Yard, Equipment at Railway Stations.
8. Signalling and Interlocking: Objectives, Classification of Signals, Types of Signals in Stations and Yards, Automatic Signalling, Principal of Interlocking.
9. Modernization of Railway Tracks: High Speed Tracks, Improvement in existing track for high speed, Ballastless Track, MAGLEV Track.
10. Introduction to Airport Engineering: Air Transport Scenario in India and Stages of Development, National and International Organisations.
11. Airport Planning: Aircraft Characteristics, Factors for Site Selection, Airport Classification, General Layout of an Airport.
12. Obstructions and Zoning Laws: Imaginary Surfaces, Approach Zones and Turning Zones.
13. Runway Orientation and Design: Wind Rose Diagram, Basic Runway Length, Corrections, Geometric Design Elements, Runway Configuration, Aircraft Parking System.
14. Taxiway Design: Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.
15. Visual Aids: Marking and Lighting of Runway, Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.

Text Books:

Aggarwal, M.M. “Railway Engineering”, Prabha and Company, New Delhi, 1997.
Saxena, S.C., and Arora, S.P. “A Text Book of Railway Engineering”, Dhanpat Rai and Sons, Delhi, 1997.
Khanna, S.K., Arora, M.G., and Jain, S.S. “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.
Horenjeff, R. and McKelvey, F. “Planning and Design of Airports”, McGraw Hill Company, New
I. York, 1994.

6.2 DESIGN OF STEEL STRUCTURES-I

1. Allowable stresses in direct tension, compression, bearing and shear in structural steel.
2. Riveted, Bolted and Welded connection for axial loads.
3. Design of Tension and Compression Members
4. Design of steel Beams, Purlins and Encased Beams
5. Design of Built up Columns under Axial Loading using Lacing and Battening Systems.
    1. Design of Column Bases under direct and eccentric Loads (Slab Base, Gusseted Base and Grillage foundation)
6. Design of Steel Roof Truss : design of members for the given loads, design of riveted and welded connections, detailed working drawings.
7. Design of Plate Girder for static loads (UDL or Concentrated Loads at fixed points)

Text BOOKS:

1. Design of Steel Structures Vol.-III By Vazirani & Ratwani
2. Design of Steel Structures By Arya & Azmani
3. Steel Structures By S.K.Duggal
4. Design of Steel Structuras Vol.-I By Ram Chandra

6.3 IRRIGATION ENGINEERING-I

1. **METHOES OF IRRIGATION:**

Advantages and disadvantages of irrigation, water requirements of crops, factors affecting water requirement, consumptive use of water, water depth or delta and crop relation, Duty of water, relation between delta, duty and base period, Soil crop relation-ship and soil fertility, sprinkler irrigation advantages & limitations. Planning and design of sprinkler irrigation, drip irrigation advantages & limitations, suitability.

2. **CANAL IRRIGATION:**

Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, Silt theories-Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy & Lacey's theories, suspended and bed loads.

3. **LINED CANALS:**

Types of lining, selection of type of lining, Economics of lining, maintenance of lined canals, silt removal, strengthening of channel banks, measurement of discharge in channels, design of lined canals, methods of providing drainage behind lining.

4. **LOSSES IN CANALS, WATER LOGGING AND DRAINAGE:**

Losses in canals-Evaporation and seepage, water logging, causes and ill effects of water logging-anti water logging measures. Drainage of land, classification of drains - surface and subsurface drains, Design considerations for surface drains, Advantages and maintenance of tile drains.

5. **INVESTIGATION AND PREPRRATION OF IRRIGATION PROJECTS:**

Classification of project, Project preparation-investigations, Design of works and drawings, concept of multi - purpose projects, Major, Medium and miner projects, planing of an irrigation project, Economics & financing of irrigation works. Documentation of project report.

6. **TUBE - WELL IRRIGATION :**

Types of tube - wells - strainer type, cavity type and slotted type. Type of strainers, Aquifer, porosity, uniformity coefficient, specific yield & specific retention, coefficients of permeability, transmissibility and storage. Yield or discharge of a tube well, Assumptions, Theim & Duputi's formulae. Interference of tube wells with canal or adjoining tube-wells, optimum capacity, Duty and delta of a tube well. Rehabilitation of tubewell.

7. **RIVER TRAINING WORKS:**

Objectives, classification of river-training works, Design of Guide Banks. Groynes or spurs - Their design and classification ISI. Recommendations of Approach embankments and afflux embankments, pitched Islands, Alficial cut-off objects and design Considerations River control - objectives and methods.

TextBooks:

1. Principles & practice of Irrigation Engg. S.K..Sharma
2. Irrigation & Water Power Engg. B.C. Punmia, Pande B.B.Lal
3. Fundamentals of Irrigation Engg. Dr. Bharat Singh
4. Irrigation Engg. & Hydraulic Structure S.R.Sahasrabudhe
5. Irrigation Engg. & Hydrauloc Structure Varshney, Gupta & Gupta
6. Irrigation Engg. & Hydraulic Structure Santosh Kumar Garg

6.4 FOUNDATION ENGINEERING

1. Shallow Foundation-I: Type of shallow foundation Depth and factors affecting it. Definition of ultimate bearing capacity, safe b.c. and allowable b.c. Rankine's analysis and Terzaghi's analysis. Types of failures. Factors affecting bearing capacity. Skemptons equation. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration Test. Their procedure, merits and demerits Factors affecting 'N' value Corrections to be applied to observed value.

2. Shallow Foundation-II: Bosussinesq equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams. Newmarks chart and its construction. Two - to one method of load distribution. Comparison of Bosussinesq and westerguard analysis for a point load. Limitations of elastic formula. Contact pressure Distribution. Causes of settlement of structures comparison of Immediate and consolidation settlement calculation of settlement by plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code. Situation most suitable for provision of rafts. Proportioning of rafts in sand-s and Clays. Various methods of designing raft. Floating foundation.

3. Machine Foundations: Basic definition of theory of vibration terms, Analysis of theory of single degree system for :-

i. Free vibrations.

ii. Damped Free vibration

iii. Forced vibrations with constant Harmonic Excitation (Frequency response curves) Dynamic soil properties (Equivalent spring constants) Determination of Cu by cyclic plate load test and Block vibration test. Natural frequency of foundation-soil system by Barkans Method. Co-relation between Cu and other dynamic properties of soil. Type of machine Foundations - Neat sketches and brief description.

4. Soil Investigation: Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples.

i. Open Drive samples

ii. Stationery piston sampler

iii. Rotary sampler

Geophysical exploration by seismic and resistivity methods. Bore Hole log for S.P.T.

5. Pile Foundations – I: Necessity and uses of piles classification of piles. Merits and demerits of different types based on composition. Types of pile driving hammers & their comparison. Effect of pile driving on adjacent ground. Use of engineering News Formula and Hiley's Formula for determination of allowable load. Limitations of pile driving formulae. Pile load test-object, prerequisites,
test arrangement, procedure and assessment of safe load. Separation of skin friction and point resistance using cyclic pile load test date. Related numerical problems.

6. Pile Foundation – II: Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay-Safe load on a Friction and point Bearing pile. Pile in sand Spacing of piles in a group, factors affecting capacity of a pile group by Terzaghi - peck approach. Efficiency of pile group by converse - Labare formula and fleds formulas. Bearing capacity of apile group in clay by block failure and individual action approach. Approximate methods for determination of stress on lower strata in pile groups. Calculation of settlement of
friction pile group in clay using the following equation.

S = H x Cc Log10 (Sigma + del Sigma) 1+ eo Sigma Related Numerical problems. Settlement of pile groups in sand Negative skin friction.

7. Caissons and Wells: Major areas of use of caissons advantages and disadvantages of open box and pneumatic caissons. Essential part of a pneumatic caisson. Components of a well foundation. Calculation of allowable bearing pressure. Conditions for stability of a well, Terzagh's analysis for PTU/BOS/CE/101/08-05-2004/BATCH 2004 38 lateral stability for a light well-embedded in sand. Modification of the analysis for a heavy well. Forces acting on a well foundation. Computation of scour depth.

TextBooks :

1. Soil Mechanics & Foundation Engineering by B.C.Punmia
2. Geotechnical Engineering by Alam Singh
3. Soil Mechanics by V.N.S. Murthy

6.5 ELECTIVE I

1.ARCHITECTURE AND TOWN PLANNING

1.Brief history of Architecture, Egyptian, Greek, Roman and Indian architecture. Evolution of various structural forms. Impact of materials on building forms and construction techniques.
2. Philosophy of architectural design: scale, form, texture, balance, skyline, unity, harmony, contrast, proportion. Color in architecture, site selection and orientation of residential buildings.
3.Evolution of human settlements: Factors and Forces. Utopian concepts of city planning: garden city, vertical city, broad acre city, linear city, siper Block and neighborhood unit concepts.
4.Concept for spatial arrangements of land uses: concentric zone, sector and multiple nuclei concepts, and their applicability to Indian condition Density in residential and non-residential areas.
5.Master plans; case studies: one for a new town plan and one for master plan of an existing city. Zoning and sub-division regulations and building byelaws. Agencies for implementation of master plans. Public participation.
6.Problem of slums. Approaches for environmental improvement of slums.

Impotant note:
The internal assessment shall include.
1.Site planning exercise.
2. Seminar

Text Books:

1. A history of Architecture by Sir Banister Flechure.
2. A General History of Architecture by Bruce All sopp.
3. Architecture by John Gloag.
4. The Principles of Architecture Composition by Howard Robertson.
5. Indian Architecture by Percy Brown.
6. The Urban Pattern City planning and Design by Arthur B. Galion and Simon Eisner

4 EARTHQUAKE RESISTANT DESIGN

1. **Strong motions and Dynamics of Structure:**

   Strong motions

   Introduction, Terminology of Strong Motion, Nature of Ground Motion: source effect, path effect, site effect. Amplitude, peak ground acceleration, vertical acceleration, seismometer and other seismic instruments.

   Dynamic of Structure

   Modeling of Structure, lumped mass approach, equation of Motion, mathematical and structural modeling, System of Multiple Degrees of Freedom, Responses Spectrum.

2. **Effect and Behavior of Structures under Earthquake:**

   Introduction, Natural time period of site and structure, liquefaction of soil, Restoring force, Damping, Effects of Structural Irregularities (vertical, plan and mass). Seism resistant Building Architecture, Building Characteristics.

   Introduction of IS 1893:2002, Design Philosophy, use of IS 1893:2002 and Determination of Design Lateral Forces: Equivalent Static Lateral force Method.

3. **Determination of Lateral Forces:**

   Use of IS 1893:2002, Determination of Design Lateral Forces: Response Spectrum Method, Time History Method. (eigen values and eigen vectors, modal participation factors, modal mass, Use of ABS, SRSS, CQC methods)

4. Ductile detaling of RCC Structure, Earhquake Resistant Design of Masonry Buildings and Retrofitting: Ductility Consideration:

   Introduction, assessment of Ductility, Factors Affecting Ductility, Ductility factors, Ductile Detaling as per Use of IS 13920:1993, Load transfer mechanism of joints

   Earthquake Resistant Desigm of Masonry Buildings and retrofitting:

   Behavior of masonry building under earthquake, lateral load Analysis of Masonry Building.

   Design of brick masonry wall under vertical and laterals Loads

   Cocepts of Repair, Restoration and Strengthening of existing buildings, Methods of Retrofitting.

Text Books:

1. Earthquake Resistant Design of Structures by Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt Lts.
2. Elements of Structual Dynamics by Glen V. Berg, Prentice Hall Englewood Cliffs, New Jersey
3. Dynamics of Structures by Anil K. Chopra, Pearson Education
4. Geotechnical earthquake engineering by Steven L. Kramar, Pearson Education

5 PRESTRESSED CONCRETE

Introduction

Basic concepts of prestressed concrete, advantage of prestressed concrete in comparison with RCC application of prestressed to various to various building elements, bridge , water tanks and precast elements.

Materials

Materials requirements for prestressing concrete- High strength concrete prestressing steel wires, strands and high strength bars. Stresses in high strength steel and stress strain relationship, tendon profile.

Prestressing Methods

Introduction to prestressing methods- pre tensioning and post tensioning, their suitability and comparison, circular prestressing and its application.

Bending and Shear Capacity

Concept of bending and shear capacity of prestressed members. Calculation of bending stresses in rectangular simply supported beams with straight and parabolic profile of tendons.

Losses in Prestressing

Types of losses in prestress- Elastic shortening, creep and shrinkage of concerete, friction loss and stress relaxation in prestress steel. Computation of losses for simple beam problems.

6 QUANTITY SURVEYING AND VALUATION

1. Introduction to quantity surveying and its importance. Duties of quantity surveyor.
2. Types of estimates
    a) Preliminary estimates
    - Plinth area estimate
    - Cubic rate estimate
    - Estimate per unit base
    b) Detailed estimates
    - Definition stage of preparation- details of measurement and calculation of quantities and abstract
3. Measurement

6.6.1.1.1 Units of measurement for various items of work as per BIS:1200

6.6.1.1.2 Rules for measurements

6.6.1.1.3 Different methods of taking out quantities- centre line methods and long wall and short wall method.

4. Preparation of Details and Abstract Estimates from Drawing for:
    - A small residential buildings with a flat roof comprising of Two rooms with W.C, bath, kitchen and verandah
    - Earthquake for unlined channel
    - WBM road and pre-mix carpeting
    - Single span RCC slab culvert
    - Earthquake for plain and hill roads
    - RCC work in beams, slab, column and lintel, foundation
    - 10 users septic tank
5. Calculation of quantities of material for
    - Cement mortars of different proportion
    - Cement concrete of different proportion
    - Brick/ stone masonry in cement mortar
    - Plastering and pointing
    - White washing, painting
6. Analysis of Rates
    - Steps involved in the analysis of rates, Requirement of material, labour, sundries, contractor's profit and overheads
    - Analysis of rates for finished items when data regarding labour, rates of material and labour is given:
        - Earthquake in excavation in hard/ ordinary soil and filling with a concept of lead and lift.
        - RCC in roof slab/ beam/ lintels/ columns
        - Brick masonry in cement mortar
        - Cement plaster,White washing, painting

- Running and maintenance cost of construction equipment.

7. Contractorship
   - Meaning of contract
   - Qualities of a good contractor and their qualification
   - Essentials of a contract
   - Types of contracts, their advantages, disadvantages and suitability, system of payment
   - Single and two cover-bids; tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period
   - Classification and types of contracting firms/ construction companies

8. Preparation of Render Document based on common schedule Rates(CSR)
   - Introduction to CSR and calculation of cost based on premium on CSR.
   - Exercises on writing detailed specification of different types of building works from excavation to foundations, superstructure and finishing operation.
   - Exercise on preparing tender document for the following:
   - Earth work
   - Construction of a small house as per given drawing
   - RCC works
   - Pointing, plastering and flooring
   - White-washing, distempering and painting
   - Wood work including polishing
   - Sanitary and water supply installations
   - False ceiling, aluminum(glazed) partitioning
   - Tile flooring including base course
9. Exercises on preparation of comparative statements for item rate contract.
10. Valuation

6.6.2 Purpose of valuation, principles of valuation

6.6.3 Definition of various terms related to valuation like depreciation, sinking fund, salvage and scrap value, market value, fair rent, year's purchase etc.

6.6.4 Methods of valuation (i) replacement cost method (ii) rental return method.

6.6 OPEN ELECTIVE

1. CONSTRUCTION MANAGEMENT AND ACCOUNTS

1 Introduction:

- Significance of construction management
- Main objectives of construction management and overview of the subject.
- Function of construction management, planning, organizing, staffing. and directing, controlling and coordinating, meaning of each of these with respect to construction job.
- Classification of construction into light, heavy and industrial construction
- Stages in construction from conception to completion
- The construction team: owner, engineer, architect and contractors, their functions and inter-relationship.

2. Construction planning:

- Importance of construction planning
- Stages of construction planning
  - Pre-tender stage
  - Contract stage
- Scheduling construction works by bar charts
  - Definition of activity, identification of activities though
  - Preparation of bar charts for simple construction work
  - Preparation of schedules for labor, materials, machinery and finances for small works
  - Limitations of bar charts
- Scheduling by network techniques
  - Introduction to network techniques; PERT and CPM, differences between PERT and CPM terminology

3. Organization

- Types of organization line. Line and staff, functional and their characteristics

4 Site Organization:

- Principal of storing and stacking material at site
- Location of equipment
- Preparation of actual job layout for a building
- Organization labour at site

5 Construction labour

- Conditions of construction workers in India, wages paid to workers
- Important provisions of the following acts:
  - Labour welfare fund act 1936 (as amended)
  - Payment of wages act 1936(as amended)
  - Minimum wages act 1948 (as amended)

6. Control of progress:

- Methods of recording progress
- Analysis of progress
- Taking corrective actions keeping head office informed
- Cost time optimization for simple jobs- Direct and indirect cost, variation with time, cost optimization

7 Inspection and quality control:

- need for inspection and quality control
- Principles of inspection
- Stages of inspection and quality control for
  - Earth work
  - Masonry
  - RCC
  - Sanitary and water supply services

8. Accidents and safety in construction

- Accidents—causes and remedies
- Safety measures for
  - Excavation work
  - Drilling and blasting
  - Hot bituminous works
  - Scaffolding, ladders, from work
  - Demolitions
- Safety campaign and safety devices

ACCOUNTS

9. Public works accounts:

Introduction, technical sanction, allotment of funds, re-appropriation of funds bill, Contractor ledger, measurement book running and final account bills complete, Preparation of bill of quantities (BOQ), completion certificate and report, hand receipt, a quittance roll. Muster rolllabour, casual labour roll-duties and responsibility of different cadres, budget-stores, returns, accont of stock, masc. W.advances T & P-verification, survey report, road metal material charged direct to works, account- Expenditure and revenue head, remittance and deposit head, definition of cash, Precaution of cash, precaution in custody of cash book, imprest account, temporary advance, treasury challan, preparation of final bills.

Text BOOKS

1. Shrinath LS,"PERT and CPM-Principals and Applications", New Delhi, East West press.
2. Harpal Singh," Construction Management and Accounts", New Delhi, Tata Mc Graw Hill publishing Company.
3. Peurifoy, RL, " Construction planning, Equipment and methods", Tokyo, Mc Graw Hill
4. Wakhlo, ON: "Civil Engineering Management", New Delhi light and life publishers.

2. REPAIR AND MAINTENANCE OF BUILDINGS

1. Need for Maintenance

- Importance and significance of repair and maintenance of building
- Meaning of maintenance
- Objectives of maintenance
- Factors influencing the repair and maintenance.

2. Agencies Causing Deterioration (Source, Causes, Effects)

- Definition of deterioration/decay
- factors causing deterioration, their classification
  - Human factors causing deterioration
  - Chemical factors causing deterioration
  - Environmental conditions causing deterioration
  - Miscellaneous factors
- Effects of various agencies of deterioration on various building materials i.e. bricks timber, concrete, paints, plastics, stones

3. Investigation and Diagnosis of Defects

- Systematic approach/procedure of investigation
- Sequence of detailed steps for diagnosis of building defects/ problems
- List non- destructive and others tells on structural elements and materials to evaluate the condition of the building and study of three most commonly used tests.

4 Defects and their root causes

- Define defects in building
- Classification of defects
- Main causes of building defects in various building elements
  - Foundations, basements and DPC
  - Walls
  - Column and beams
  - Roof and terraces
  - Joinery
  - Decorative and protective finishes
  - Services
  - Defects caused by dampness

5 Materials for Repair, maintenance and protection

- Compatibility aspects of repair materials
- State application of following materials in repairs:
  - Anti corrosion coatings
  - Adhesives/bonding aids
  - Repair mortars
  - Curing compounds
  - Joints sealants
  - Waterproofing systems for roofs
  - Protective coatings

6. Remedial measures for Building Defects

- Preventive maintenance considerations
- Surface preparation techniques for repair
- Crack repair methods
  - Epoxy injection
  - Grooving and sealing
  - Stitching
  - Adding reinforcement and grouting
  - Flexible sealing by sealant
- Repair of surface defects of concrete
  - Bug Holes
  - Form tie holes
  - Honey comb and larger voids
- Repair of corrosion in RCC elements
  - Steps in repairing
  - Prevention of corrosion in reinforcement
- material placement techniques with sketches
  - Pneumatically applied (The qunite techniques)
  - Open top placement
  - Pouring from the top to repair bottom face
  - Bird's mouth
  - Dry packing
  - Form and pump
  - Preplaced-aggregate concrete
  - Trowel applied method
- Repair of DPC against rising dampness
  - Physical methods
  - Electrical methods
  - Chemical methods
- Repair of walls
  - Repair of mortar joints against leakage
  - Efflorescence removal
- Waterproofing of wet areas and roofs
  - Water proofing of wet areas
  - Water proofing of flat RCC roofs
  - Various water proofing systems and their characteristics
- Repair of joints in buildings
  - Types of sealing joints with different types of sealants
  - Techniques for repair of joints
  - Repair of overhead and underground water tanks

TextBOOKS

1. Gahlot P.S. Sanjay Sharma, Building defects and maintenance Management by CBS publishers, New Delhi
2. Nayak, BS: "Maintenance Engineering for civil Engineers" Khanna publishers, Delhi
3. Ransom W H: " Building Failures-Diagnosis and Avoidance" publishing E and F.N Span
4. Hutchinson B D:etc "Maintenance and Repair of buildings" published by Newness-butterworth

6.7 BUILDING PLANNING AND DESIGN

Brick & Stone Masonry: Terms used; types of bonds; their merits and demerits; Rubble and ashlar joints in stone masonary, introduction to cement concrete hollow blocks, advantages and disadvantages of concrete block masonry over brick masonry.

Walls and Foundation: Load bearing and non-load bearing walls,estimation of load on walls and footings, Thickness considerations, partition and cavity walls design of masonry walls, pillars and footings.

Damp Proofing: Sources, Causes of dampness in buildings, bad effects of dampness, methods of damp proofing.

Arches and Lintels: Introduction to terms used in Arches; different types of arches; brick and stone arches, types and functions of lintels.

Roofs: Introduction, terms used, types of roof trusses and roof coverings, details of rain proofing, rain water pipes.

Doors and Windows: Introduction, terms used, location of doors and windows, types of doors and windows, methods of fixing doors and window frames in walls. Ventilators.

Plastering, Pointing and Painting: Introduction, objects and types, special materials for plastered surfaces, distempering, white washing and color washing of plastered surfaces.

Floors: Introduction, various types of floors commonly used and their suitability for different buildings, constructional details of concrete ant Terrazzo floorings, marble flooring, anti- termite treatment.

Miscellaneous Topics: Site selection; and orientation of building; Principles of acoustical design of Building; Fire proof construction methods: Non Engineered Earth quake resistant design of building; Construction and expansion joints; Building bylaws

Text Books:

1. *S.K. Sharma Building Construction*
2. *Sushil Kumar Building Construction*

Reference Books:

3. *B.C. Punmia Building Construction*

6.8 CONCRETE STRUCTURE DRAWING (COMPUTER AIDED)

Detailed Working Drawings (Computer Aided):

1. Isolated Footing : Rectangular, Circular and Square footing.
2. Combined Footing : Rectangular, Trapezoidal, Strap and Raft Footing
3. Spherical and Conical Domes
4. Cantilever and Counterfort Retaining Walls
5. Intz Tank
6. Design & detailing of an RCC multistorey frame with the help of design and detailing software.

6.9 HYDROLOGY AND DAMS

1. Introduction, Precipitation: Importance of hydrological data in water resources planning. The hydrologic cycle. Mechanics of precipitation, types and causes, measurement by rain gauges, Gauge net-works, hyetograph, averaging depth of precipitation over the basin, mass-rainfall curves, intensity duration frequency curves, depth area-duration curves.

2. (a) Interception, Evapo- transptration and Infiltration: Factors affecting interception, evaporation from free water surfaces and from land surfaces, transpiration, Evapotranspiration.

(b) Infiltration Factors affecting infiltration, rate, Infiltration capacity and its determination.

3. **Runoff:** Factors affecting runoff, run-off hydrograph, unit hydrograph theory, S-curve hydrograph, Synder's synthetic unit hydrograph.

4. **Peak Flows**: Estimation of Peak flow-rational formula, use of unit hydrograph, frequency analysis, Gumbel's method, design flood and its hydrograph.

5. Gravity Dams-Non Overflow Section: Forces acting, Stability factors, stresses on the faces of Dam, Design of profile by the method of zoning, elementary profile of a dam.

6. **Gravity Dams-Spillways:** Creagers profiles neglecting velocity of approach, profile taking velocity of approach into account, Upstream lip and approach ramp, Advantages of gated spillways, Discharge characteristics of spillways.

7. **Arch and Buttress Dams:** Classification of arch dam- constant radius, constant angle and variable radius , Cylinder theory, Expression relating central angle and Cross-Sectional area of arch. Types of buttress dams, Advantages of buttress dams.

8. **Earth Dams:** Components of earth dams and their functions, Phreatic line determination by analytical and graphical methods.

Text Books:

1. Engineering Hydrology - J.Nemec.
2. Hydrology Chester, Wisler - Brater.
3. Engineering Hydrology - Stanley Buttler.
4. Ground Water Hydrology - TODD.
5. Engineering for Dams Vol. II & III - Creager Justin & Hinds.
6. Design of Small Dams - U.S.B.R.
7. Hydrology by. S.K.Garg
8. Hydrology by. R.K. Sharma
9. Irrigation and Power Engg. By B.C. Pummie

F. SEVENTH/ EIGHTH SEMESTER

8.1 IRRIGATION ENGINEERING-II

1. Theories of Seepage: Seepage force and exit gradient, salient features of Bligh's Creep theory, Lane's weighted Creep theory and Khosla's theory, Determination of uplift. Pressures and floor thickness.

2. Design of Weirs: Weirs versus barrage, design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.

3. energy Dissipation Devices: Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipators and their hydraulic design.

4. Diversion Head Works: Functions and investigations: component parts of a diversion head work and their design considerations, silt control devices.

5. Distributory Regulators: Offtake alignment, cross-regulators – their functions and design, Distributory head regulators, their design, canal escape.

6. Canal Falls: Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls.

7. Cross-Drainage works : Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons and level crossing.

8. Canal Out-lets : Essential requirements, classifications, criteria for outlet behaviours, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of non-modular, semi-modular and modular outlets.

Text Books:

1. Design of Irrigation Structures by S.K. Sharma.
2. Irrigation and Water Power Engg. By B.C. Punmia & Pande B.B. Lal.
3. Irrigation Engg. and Hydraulics Structures by S.R. Sahasrabudhe.
4. Irrigation Engg. Vol.I, II & III by K.R. Sharma.
5. Irrigation Practice and Design Vol. I to VII by K.B. Khushlani.
6. The Fundamental Principles of Irrigation and Water Power by B.B. Priyani.
7. Irrigation Engg. Vol. I & II by Ivan E. Houk.
8. Fundamentals of Irrigation Engg. by Dr. Bharat Singh.
9. I.S.I.Codes.

8.2 DESIGN OF STEEL STRUCTURE II

ANALYSIS OF STATICALLY INDETERMINATE STRUCTURES: Degree of static and kinematic indeterminacies, analysis of indeterminate beams, rigid frames and trusses by method of consistent deformation, law of reciprocal deflections, method of least work, induced reactions on statically indeterminate beams, rigid frames and trusses due to yielding of supports.

2. FIXED AND CONTINUOUS BEAMS: Analysis of fixed beams, continuous beams and propped cantilevers by moment-area theorem and strain energy method, fixed end moments due to different types of loadings, sinking and rotation of supports, bending moment and shear force diagrams for fixed beams and propped cantilevers, slope and deflection of fixed beams, analysis of continuous beams by the Three moment equation (Clapeyron's theorem) due to different types of loadings, effect of sinking of supports.

3. SLOPE-DEFLECTION METHOD: Introduction, slope-deflection equations, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements.

4. MOMENT-DISTRIBUTION METHOD: Introduction, absolute and relative stiffness of members, stiffness and carry-over factors, distribution factors, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements, symmetrical beams and frames with symmetrical, skew-symmetrical and general loading.

5. ROTATION CONTRIBUTION METHOD: Introduction, basic concept, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loadings and yielding of supports, symmetrical beams and frames, general case- storey columns unequal in height and bases fixed or hinged.

6. APPROXIMATE METHODS OF STRUCTURAL ANALYSIS: Vertical and lateral load analysis of multistory frames, portal, cantilever and substitute-frame methods and their comparison.

7. SPACE FRAMES: Introduction, simple space truss, types of supports, equilibrium and stability conditions, analysis of determinate and indeterminate space frames using tension coefficient method.

8. INFLUENCE LINES FOR STATICALLY INDETERMINATE STRUCTURES: Muller- Breslau principle for statically determinate and indeterminate beams, trusses and rigid frames, influence lines for reactions, shear force and bending moment for statically indeterminate beams, trusses and rigid frames.

Text BOOKS :

1. Basic structural analysis - C.S. Reddy
2. Intermediate structural analysis - C . K. Wang.
3. Indeterminate structural analysis - J. Sterling Kinney
4. Theory of structures - B.C. Punmia,

3. ELECTIVE II

1. WASTE MANAGEMENT

- **Waste water Collection:** Plumbing, types of sewers design consideration. Construction & maintenance. Storm water sewers.
- Wastewater Characterization: Constituents.
- Wastewater Treatment: On side and centralized treatment systems.
- Pre-and Primary Treatment: Screen grit removal, oil and grease removal
- Secondary treatment: Activated sludge process, conventional and extended aeration. Waste Stabilization ponds. UASB process. UASB post treatment.
- Advanced wastewater treatment.
- Wastewater and sludge disposal: Reuse systems. Wastewater disposal on land and water bodies, disposal of sludge.
- Municipal Solid waste: Collection, characterization, transport.treatment7disposal.
- Types of industrial waste: Liquid, solid, atmospheric and hazardous, hazardous wastes: Characterization and treatment

Text Books:

	Name of Books/ Authors/ Publishers	Year of Publication
1.	Davis M.L.and Cornwell.D.A."Introduction to Environmental Engineering" McGraw Hill.	1998
2.	Masters.G.M." introduction to environmental engineering and Science" Prentice hall of India.	1998
3.	Peavy, H.S.Rowe D. R and Tehobanoglous,G. "Environmental Engineering" McGraw Hill.	1986
4.	Arceievala, S.J "wastewater treatment for pollution control" Tata Mcgraw Hill	2000

2. ADVANCED CONSTRUCTION MATERIALS

- **Advanced Construction Materials**
  - **Fibers and Plastics.**
    Types of Fibers- Steel Carbon, Glass fibers, use of Fibers as construction materials. Properties of Fibers'. Types of Plastic- PVC, RPVC, HDPE,FRP, GRP etc. Colored plastic sheets. Use of plastic as construction Material
  - **Artificial Timber**
    Properties and uses of artificial timber. Types of artificial timber available in market, Strength of artificial timber.
  - **Miscellaneous materials**
    Properties and uses of acoustics materials, wall claddings, plaster board, micro-silica, artificial sand, bonding agents, adhesives etc.

- **Advanced Concreting Methods**
  - **Prestressed Concrete**
    Grades of concrete and prestressing cables for prestressed concrete. Methods of pre-tensioning and post tensioning. Equipments and accessories for prestressing Precautions during prestressing of members.
  - **Under water Concreting**
    Underwater concreting for bridge piers and bored pile construction. Tremy method of underwater concreting, procedure and equipments required for termy method. Properties, workability and water cement ratio of the concrete required.
  - **Ready mix Concrete**

Necessity and use of ready Mix Concrete. Production and equipments for RMC. Ready mix Concrete plant. Conveying of RMC. Transit Mixers-working and time of transportation. Workability and water cement ratio for RMC. Strength of RMC.

- **Tremix Concreting method**

Definition, application of vacuum dewatering concreting. Equipment used in tremix concreting. Procedure of vacuum dewatering concreting (Tremix).

- **Special concretes**

Properties, uses and procedure of roller compacted concrete.
Properties and uses of high impact Resisting concrete.
Properties, uses and constituents of steel fiber reinforced concrete.
Percentage of steel fibers in SFRC. Effects of size, aspect ratio and percentage of steel fibers on strength of concrete.

Advanced Construction methods.

- **Formwork**

Steel formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork. Slip formwork- meaning use of slip formwork. Process of concreting with slip forms.

- **Construction of multistoried Buildings**

Use of lifts, belt conveyors, Pumped concrete, equipments and machinery required for construction of multistoried buildings. Precautions and safety measures.

- **Prefabricated Construction**

Meaning of prefabrication and precast. Methods of prefabrication-plant prefabrication and site prefabrication. Linear members, rigid frames, roofing and flooring members, R .C. Doors and windows, Wall panels, jointing of structural members.

- **Soil Reinforcing Construction**

Necessity of soil reinforcing, use of wire mesh and geosynthetics. Strengthening of embankments, slope stabilization in cutting and embankments by soil reinforcing techniques.

- **Hoisting and conveying Equipments**
  - **Hoisting Equipments**

Principal and working of towers cranes, Crawler cranes, Truck mounted cranes, gantry cranes, mast cranes, Derricks.

  - **conveying Equipments**

Working of belt conveyors. Types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.

- **Earth moving machinery**
  - **Excavation Equipments**

Use, working and outputs of bulldozers, scrapers, graders and power shovels, JCB, draglines.

  - **Compacting Equipments**

Use of rollers, roller types –plain rollers, sheep footed rollers, Vibratory rollers, pneumatic rollers. Rammers- use and working.

- **Concreting Equipments**
  - **concrete Mixers**

Types of concrete mixers. Weigh batching equipments, equipments for transportation of concrete- trollies, lifts, Transit mixers, Concrete Vibrators- Needle vibrators, Screed vibrators. Automatic concrete plants- layout, process and working.

  - **Stone Crushers**

Types of stone crushers, capacities and working. Equipments for production of artificial sand.

- **Miscellaneous Equipments and Equipment management**
  - **Miscellaneous equipments**

Pile driving equipments, pile hammers, selection of hammers. Working of hot mix bitumen plant, Bitumen paver.

Grouting equipments, Floor polishing machine.

  - **Equipment management**

Standard equipment, Special equipment, Selection of equipment, Owning and operating cost of construction equipment. Economic life of construction equipment.

Preventive maintenance of equipment, Break down maintenance of equipments

Practical:

Skills to be developed:

Intellectual Skills:

1. Know the new materials of construction.
2. Get acquainted with advanced methods of construction.
3. Select suitable construction equipments for execution of various constructions activities.

List of practical:

1. Collect Specifications/ properties of at least five advanced materials of construction and write the report on the same.
2. Writing report on Tremie method of concreting for piles/ Bridge piers.
3. Finding effect of size of fibers and aspect ratio (I/d ratio) of steel fibers on the strength of steel fiber reinforced concrete.
4. Finding effect of percentage of steel fibers on the strength of steel fiber reinforced concrete.
5. Writing a report on method of preparation and conveyance of ready mix concrete.
6. Writing a report on working and output of any three earth moving machinery.
7. Observing at site/ Video/LCD demonstration of bitumen paver and writing report of the process and equipments observed.
8. Preparing a detailed account of types, numbers and drawings of steel formwork required for a two storied framed structured residential building.

8.4 ELECTIVE III

1. THEORY AND APPLICATIONS OF GEOGRAPHIC INFORMATION SYSTEMS

- Introduction, Geographical concepts and terminology, difference between image processing system and GIS
- Utility of GIS, various GIS packages and their salient features, essential components of a GIS
- Data acquisition through scanners and digitizers. Methods of digitization.
- Raster and vector data, data storage, verification and editing.
- Data preprocessing. Format conversion, data compression and reduction techniques. Run length coding, rectification and registration, interpolation.
- Data base structure- Hierarchical data, network systems, relational database, and data management role of remote sensing in GIS.
- Data manipulation and analysis, spatial and mathematical operations on data. Area analysis. Query-based analysis. Measurement and statistical modeling.
- Programming language in GIS, Data output, application of GIS for various neutral resources mapping & monitoring and for engineering applications.

Text Books:

1. Burroughs P.A. and McDonnell R.A" Principles of Geographic information for land resources assessment", Oxford University press.
2. De Mers. M.N "Fundamentals of Geographic's information system' 3rd Ed,, John Wiley.
3. Legg C.A "Remote sensing and Geographic information system" John Wiley.
4. Chandra A.M and Ghosh S.K "Remote Sensing and Geographical information system", Alpha Science.
5. Maguire D.J Batty. M. and Godchild. M. (Eds.).. "GIS Spatial Analysis and Modeling", ESRI Press.

2 DIGITAL IMAGE PROCESSING

1. Introduction to remote sensing data analysis, Spectral, spatial and radiometric resolutions, Visual data interpretation, Image formats, digital image and its characteristics, image processing system.

2. Initial data statistics, Histogram and Scatter plot.

3. Image preprocessing, atmospheric, radiometric a geometric corrections, image enhancement and restoration, contrast stretching linear and non-linear.

4. Noise removal, low, medium and high pass filters, multispectral enhancement.

5. Image transformation - mathematical operators, KLT, PCA, FFT, image analysis feature extraction, pattern recognition.

6. Classification –Supervised and unsupervised techniques.

7. Accuracy assessment procedures, post classification techniques.

8. Data fusion, fuzzy logic, advance image processing techniques and concepts, application of digital image processing to various engineering problems.

Text Books:

1. Agarwal, C. S and Garg. P.K, " Remote sensing in natural resources monitoring and management" A.H Wheeler & Co
2. Chandra A.M and Ghosh S.K "Remote sensing and geographical information Systems" Alpha Science.
3. Gonzalez R.C and Wintz. "Digital Image processing" Addison Wesley
4. Jia. X and Richards .J.A." Remote sensing Digital Image Analysis"3rd Ed, Springer Verlag.
5. Mather. P.M "Computer processing of remotely sensed Data". John Wiley

8.5 GROUND WATER ENGINEERING

Hydrologic Cycle, Concept of Groundwater in Hydrologic Cycle, Sub Surface Strata Analysis as Aquiclude, aquitors,aquifuge and Aquifers Explanation of Unconfined, semi- confied and confied Aquifers, Perched Aquifers. Geophysical methods for Groundwater Exploration, Resistivity System, Application of Schlumberger and Wenner's configurations.

Groundwater Balance Study. Concept of Gross Recharge, Recoverable recharge, Draft and Status of Groundwater Analysis using NABARD's Norms and Local Norms. Numerical Problems on Groundwater balance Equation and Status of Groundwater stage of development, Analysis of catagories of Groundwater as white Category, Grey and Black Category.

Principle and Definition of Rainwater Harvesting. Classification and Determination of Rainwater Harvesting. Numerical problems in rainwater Harvesting. Feasibility and Design of Rainwater harvesting, Case Study on Rainwater Harvesting.

Introduction of Drilling techniques. Drilling in Alluvium and soft Rock areas, Reverse Rotary Drilling and Direct Rotary drlling methods, Calayx method, Drilling in Hard Rock area, DTH method and woodex method, Percussion Drilling. Geophysical logging and Tube Well design

Text Books:

1. Groundwater Hydrology : Devid Keith Todd
2. Hydrogeology : K.R. Karanth
3. Groundwater : H.M. Ragunnath

8.6 EARTHQUAKE RESISTANT DESIGN

1. Introduction to Earthquakes, Causes of earthquakes, basic Terminology, Magnitude, Intensity, Peak ground motion parameters.
2. Past earthquakes and Lessons learnt.
3. Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.
4. Lateral Force analysis, Floor Diaphragm action, Moment resisting frames, shear walls.
5. Concepts of seismic design, Lateral Strength, stiffness, ductility and structural configuration.
6. Provision of IS 1893 for buildings.
7. Seismic Design of Masonry Structures, Provision of IS 4326
8. Seismic Design and Detailing of R.C.C. buildings, Provision of IS 13920.

Recommeded Books:

1. Dynamics of Structures by R.W. Clough and Joseph Penzien.
2. Structural Dynamics by Mario & Paz
3. Earthquake Resistant Design by David J. Dowrick
4. Elements of Earthquake Engg By Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra
5. I.S. 1893-2002 Indian Standard Criteria for Earthquake Resistant Design of Structures.
6. I.S. 4326-1993 Indian Standard for Earthquake Resistant Design and Construction of Buildings.
7. I.S. 13920-1993 Ductile detailing of Reinforced Concrete Structures subjected to Seismic Forces.

8.7 PROJECT

ENVIRONMENT ENGINEERING (Project)

1. Design of a wastewater treatment plant for a city.
2. Design of a water treatment plant for a city.
3. Design of water distribution system for a colony.
4. Study of Groundwater or surface water quality in areas close to polluting industries.

GEOTECHNICAL ENGINEERING (Project)

Soil investigations for foundations of a multistoreyed structure-Planning, Field tests(SPT,Plate load test and DCPT),Laboratory tests and preparation of final project reports:-

Study of the area to be investigated for geotechnical design of the foundation.No. and spacing of boreholes required to be excvavated.No. of standard penetration and other related tests required to be done along with the depth of exploration. Collection of disturbed and undisturbed samples for laboratory testing. Related laboratory tests like mechanical analysis, Atterbergs' limit test etc. Determination of shear parameters by Triaxial compression test or Direct shear test etc. Praparation of the report and borehole log. Calculation of bearing capacity of thr strata at different levels. Proportioning of the footing size and depth. Estimated cost of the project.

Or Ground improvement by improving soil properties using various methods of soil stabilization, use of materials like cement, lime, bitumen, all types of fibres-natural and synthetic etc.

Books

1. Soil Mechanics and Foundation Engineering by Dr. K.R.Arora
2. Analysis of Substructures by Dr. Swami Saran
3. Geotechnical Engg. by Purshotama Raj
4. Analysis and Design of Foundations by Dr. Shamsher Prakash.

TRANSPORTATION ENGINEERING (Project)

The students will be acquainted with the following aspects of Transportation Engineering:

1. Design of Flexible Pavement
2. Design of Rigid Pavement
3. Life-Cycle Cost Analysis of Pavements
4. Pavement Management System
5. Transportation Environmental Interaction

HYDRAULIC STRUCTURES (Project)

On the basis of given data, the students will be required to prepare a preliminary project with design and drawings by making suitable assumptions. The report should elucidate the planning, execution and the maintenance stages at any one or more of the follow:-

1. Water requirement of crops.
2. Irrigation channels and canal head works.
3. Any irrigation structure (Hydraulic)
4. Surface irrigation.
5. Tube wells.
6. Drainage Schemes.
7. Dams.
8. Investigation and Planning of reservoirs.
9. Spillways and Energy dissipators.
10. Water resources and development.

STRUCTURAL ENGINEERING (Project)

The Students will be given some Multi-storeyed Building Plans and the related data. The Students are required to prepare

1. Idealisation of the Building
2. Assessment of all Loads
3. Analysis of Structures
4. Structural Design of all Components
5. Preparation of Structural Drawings
6. Estimate of the Building

The final report will be prepared which include planning, analysis, design and drawings.

TRANSPORTATION ENGG PROJECT

The students will be acquainted with the following aspects of Transportation Engineering:

1. Design of Flexible Pavement
2. Design of Rigid Pavement
3. Life-Cycle Cost Analysis of Pavements
4. Pavement Management System
5. Transportation Environmental Interaction

8.8 IRRIGATION ENGINEERING-II LABORTOARY

Following drawings are to be prepared by students:

1. Unlined canal sections
2. Lined canal sections
3. Guide Bank
4. Weir/Barrage
5. Head/ Cross regulator
6. Canal Fall (Sarda/ Inglis/ Straight Glacis/ Baffle Type)
7. Syphon Aqueduct
8. APM Outlet

6. SUGGESTIONS FOR EFFECTIVE IMPLEMENATTAION OF CURRICULUM

Curricula for degree programmes in engineering and technology have been designed by SSU Palampur faculty with close cooperation of SSE Badhani and Amritsar They have understood the systematic approach of curriculum development and implementation. While designing the curriculum they have taken in to account employment scenario, equivalence with PTU curriculum and experience of implementing existing curriculum.

Some of the suggestions for effective implementation of curriculum are:

1.Vision and mission of institute, Philosophy objective and outcome of curriculum of programmes should be understood by all teachers and students. These should be displayed in the Department so that expectation of all stake holders are clear to everyone.

2.Principal with Head of Departments should analyze the curriculum to find out the requirement of resources for its implementation and prepare an action plan for their availability in time. Institute should network with other organizations for sharing resources and adopt innovative approaches for managing whole courses.

3.HOD's and teachers are managers of whole programmes and subject teaching respectively. Their success in achieving objectives depends on preparing academic plan and its judicious execution.

4..Teachers should prepare rationale and objective of their respective subjects, structure of content, method and media and table of specification for evaluation. This should be given to student so that they are aware of the outcome of the course.

5.Set up a group of teachers and final year students for sharing experiences of curriculum implementation and suggest improve asper need..

6.Teachers are required to plan as follows for carrying out teaching learning process effectively: -

(a) Prepare profile of students for knowing their background and strengths so as to facilitate them in fulfilling their dreams of jobs and life.

(b) Analyze programme and develop teaching plan.

(c) Plan for guided self study exercises for student and available learning resources like journals, web site, educational video programming etc in addition to visit to industries and organizing industrial training, arranging expert lecture by alumni and experts from industry/ field.

(d) The co-curricular activities like organizing different camp, social gathering study tour, hobby club etc may be used to develop generic skills like communication skills, task management, problems solving, managing self, stress Management, Time Management and collaborating with others etc.

1. A project bank may be developed by the concerned department of the university in consultation with industry, research and other relevant field organizations.

2. Student may be given practical assignment and project to develop practical skills. This will help them in developing creativity and confidence for their gainful employment, (wage and self).

3. (a). Teachers and students should be aware of objectives and outcomes of whole programme and the role played by each subjects in achieving them as part of the curriculum.

   (b). Identification of project and their details should be prepared by all teachers in consultation with students at the beginning of the year. The projects should relate to state of art technology and require use of theoretical and advance planning practical knowledge.

   ©. Self learning and learning beyond syllabus should be encouraged by including optional subjects with scope of learning.

   (d). Department should develop a feedback Mechnism for teaching performance and a reward system for doing excellence work.

   (e) Academic calendar should include remedial classes and additional make up test to help academically weaker students. Students involved in mentoring junior students should be should be rewarded, who are actively doing mentoring.

6. APPENDIX

A. STUDENT CENTERED ACTIVITIES

Student centered activity play an imported role in the development of students of independent learning and self confident among students. Consulting library and visit to market or industry for gathering search information. This information will be presented by students during seminars. Expert lectures by eminent person from technical education, industry, culture areas; and alumni of the institute will also be arranged. Students will also undertake activities like mentoring students poor in academics, community service in respect of technology transfer entrepreneurship development and environmental awareness for fulfilling the outcome of programme.

B.MAJOR PROJECTS WORK

(Industry/field oriented-practice based)

As far as possible students shall be assigned live project problem with a view to:

1 Develop understanding regarding the size and scale of operation and nature of field work in which Students are going to plan their role after completing the programme of study.

2 Develop understanding of subject based knowledge given in the classroom in the control of its application at work place.

3 Provide first hand experience to develop confidence amongst the students to enable them to use and apply classroom based knowledge skills to solve practical problem of the world of work.

4 Develop social skills and abilities like interpersonal skills, communication skills, attitude and values.

For the fulfillment of above objective, SSU University will establish close linkages with 20-25 relevant organizations and provide such experience to students. It is necessary that each organization is visited well in advance by respective teachers and projects activities to be performed by students are well defined. Efforts should be made to identify actual field problems to be given as project work to the students. Project selected should be challenging. Such chosen projects assignment should be entrusted to students which are of professional value to industrial/field organization. Each teacher would supervise and guide 10-15 students.

. The placement of students for such a practical cum project work should match with the competency profile and interest of students. Students are to be assessed both by industry and engineering college faculty.

The suggested performance criterion is given below:

a)	Punctuality and regularity	10
b)	Initiative in learning/ working at site	10
c)	Level/processing of practical skills acquired	10
d)	Sense of responsibility	10
e)	Self expression/ communication skills	10
f)	Interpersonal skills	10
g)	Reports writing skills	20
h)	Viva voce	20

Note:The above is a suggestive approach.SSU Palampur may evolve their own criteria based on grond realities and cooperation from industries.

C. ENTREPRENEURSHIP DEVELOPMENT CAMP AND SETTING SELF BUSINESS CLUB IN INSTITUTE

A large population of degree holders has to think of setting up their own enterprises or businesses due to lack of opportunities in organized sector. They have to be motivated and trained to search for new opportunities and avail these for becoming an entrepreneur. For this they must be acquainted with entrepreneurship development, scope of setting up self enterprise, existing business opportunities, financial support available and various aspects of managing business. In this context an entrepreneurship awareness camp is suggested. During the camp, experts from various organizations such as banks, financial corporations, service institutes etc. Should be invited to deliver expert lectures. Successful entrepreneurs should also be invited to interact with the students. Students may be encouraged to read papers or give seminar during the camp, on entrepreneurship development related topics.

1. The camp is to be organized for two to three days at a stretch during fifth semester. Lectures will be delivered on the following broad topics. There will be no examination for this subject.

- Who is an entrepreneur?
- Need for entrepreneurship, entrepreneurial career and self employment.
- Scenario of development of small scale industries/service organization in India and other countries.
- Entrepreneurial history in India, Indian values and entrepreneurship.
- Consideration for product/business selection.
- Opportunities for business, seminar and industrial ventures.
- Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs).
- Managerial aspects of small business.
- Legal aspects of small business.

2. Assistance from District Industries Centers, Commercial banks, and State Financial Corporation's Small industries service Institutes, Research and Developments laboratories and other financial and Development Corporation.

3.In order to arrange successful entrepreneurship awareness camp, a group of interested students for setting up their self business may be identified and given responsibility of undertaking the above .A follow up mechanisms should be evolved at the institute in order to enable student to set up and manage their enterprise. This group should regularly meet after a month to see the progress of their project and get inputs from mentors.

D. ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP

A degree holder must have knowledge of different types of pollution caused due to public, Industries and construction activities. So that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

This can be done by organizing a camp at a stretch for 3-4 days. Lectures will be delivered on following broad topics. There will be no examination for this subject. Students interested to contribute in improving ecology and environment of the institute or community through various projects, may be allotted marks out of 20 (a part of final year project)

1. Sources of pollution natural and manmade, their effects on living and non living organisms.
2. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods, methods of vermin composting.
3. Pollution of air-causes and effects of man, animal, vegetation and non living organisms.
4. Pollution of water causes, effects of domestic waste and industrial effluent on living and non-living organisms.
5. Legislation to control pollution and protect environment.
6. Recycling for taking advantage of waste and reducing pollution.

It is suggested that, at the institution level, a voluntary group be formed for taking care of ecological balance by undertaking waste management projects- which would result in additional revenue to the institute, besides presenting a more friendly environment.

D. INDUSTRIAL TRAINING

Industrial Training shall be accomplished through attachment with an industry/ service sector organization. Teachers in consultation with industry/ service sector will identify the problem/ project for students. A Group of students placed in city will be monitored by the faculty or expert appointed for the purpose. During the 6 month training, the students will be required to maintain a training diary which will be required to be duly authenticated by his supervisor in the industry.