NETAJI SUBHAS UNIVERSITY

POKHARI, JHARKHAND

REGULATIONS, CURRICULUM, AND SYLLABUS

FOR

BACHELOR OF TECHNOLOGY

CIVIL ENGINEERING

COURSE STRUCTURE

1st year

1st Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BT 101	Engineering Mathematics-I	3	1	-	4	30	70	100
BT 102	Engineering Physics	4	-	-	4	30	70	100
BT 103	Programming in C	4	-	-	4	30	70	100
BT 104	Elements of Mechanical Engineering	3	-	-	4	30	70	100
BT 105	Basic of Electrical Engineering	3	-	-	4	30	70	100
BT 106	Professional Communication Skill	3	-	-	3	30	70	100
	Practical							
BT 107L	Engineering Physics Lab	-	-	4	2	15	35	50
BT 108L	Programming in C Lab	-	-	4	2	15	35	50
	Total	**20**	**1**	**8**	**27**	**210**	**490**	**700**

2nd Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BT 201	Engineering Mathematics-II	3	1	-	4	30	70	100
BT 202	Engineering Chemistry	4	-	-	4	30	70	100
BT 203	Basic Elements of Civil Engineering and Mechanics	4	-	-	4	30	70	100
BT 204	Computer Aided Engineering Drawing	4	-	-	4	30	70	100
BT 205	Basic Electronics	4	-	-	3	30	70	100
BT 206	Software Engineering	3	1	-	3	30	70	100
	Practical							
BT 207L	Engineering Chemistry Lab	-	-	4	2	15	35	50
BT 208L	Workshop Practice	-	-	4	2	15	35	50
	Total	**22**	**2**	**8**	**26**	**210**	**490**	**700**

2nd Year
3rd Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE301	Engineering Mathematics-III	3	1	-	4	30	70	100
BTCE302	Building Material	4	-	-	3	30	70	100
BTCE303	Building Construction	4	-	-	3	30	70	100
BTCE304	Strength of Material-I	4	-	-	4	30	70	100
BTCE305	Fluid Mechanics	3	1	-	4	30	70	100
BTCE306	Surveying-I	4	-	-	4	30	70	100
	Practical							
BTCE307L	Surveying lab-I	-	-	4	2	30	70	100
BTCE308L	Strength of Material Lab	-	-	4	2	30	70	100
	Total	**24**	**2**	**8**	**26**	**240**	**560**	**800**

4th Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE401	Engineering Mathematics –IV	3	1	-	4	30	70	100
BTCE402	Concrete Technology	4	-	-	3	30	70	100
BTCE403	Engineering Geology	4	-	-	3	30	70	100
BTCE404	Strength of Material-II	4	-	-	4	30	70	100
BTCE405	Hydraulics and Hydraulics Machinery	3	1	-	4	30	70	100
BTCE406	Surveying-II	4	-	-	4	30	70	100
	Practical							
BTCE407L	Surveying lab-II	-	-	4	2	30	70	100
BTCE408L	Engineering Geology Lab	-	-	4	2	30	70	100
	Total	**22**	**2**	**8**	**26**	**240**	**560**	**800**

3rd Year
5th Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE501	Engineering Hydrology	4	-	-	4	30	70	100
BTCE502	Structural Analysis-I	4	-	-	4	30	70	100
BTCE503	Geotechnical Engineering-I	4	-	-	4	30	70	100
BTCE504	Environmental Engineering-I	3	1	-	3	30	70	100
BTCE505	Transportation Engineering-I	4	-	-	4	30	70	100
BTCE506	Water ResourcesEngineering	3	1	-	3	30	70	100
	Practical							
BTCE507L	Geotechnical Engg. Lab	-	-	4	2	30	70	100
BTCE508L	Fluid Mechanics Lab	-	-	4	2	30	70	100
	Total	**22**	**2**	**08**	**26**	**240**	**560**	**800**

6th Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE601	Structural Analysis-II	4	-	-	4	30	70	100
BTCE602	Geotechnical Engineering-II	4	-	-	3	30	70	100
BTCE603	Environmental Engineering-II	3	1	-	4	30	70	100
BTCE604	Reinforced Cement Concrete I	4	-	-	4	30	70	100
BTCE605	Transportation Engineering-II	3	1	-	4	30	70	100
BTCE606X	Elective-I	4	-		3	30	70	100
	Practical							
BTCE607L	Environmental Engg. Lab	-	-	4	2	30	70	100
BTCE608L	Computer Aided Design Lab	-	-	4	2	30	70	100
	Total	**22**	**2**	**8**	**26**	**240**	**560**	**800**

List of Electives to be offered in VI Semester

1. Pre-stressed Concrete Structures (BTCE6061)
2. Coastal Engineering (BTCE6062)
3. Industrial Waste Disposal and Treatment (BTCE6063)
4. Irrigation and Drainage Engineering (BTCE6064)
5. Architecture and Town Planning (BTCE6065)
6. Mass Transportation System (BTCE606X6)
7. Construction Methods and Equipment (BTCE6067)

4th Year

7th Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE701	Engineering Economics	4	-	-	4	30	70	100
BTCE702	Reinforced Cement Concrete II	4	-	-	4	30	70	100
BTCE703	ESTIMATION AND COSTING	3	1	-	4	30	70	100
BTCE704X	Elective-II	4	-	-	3	30	70	100
BTCE705	Design of Steel Structures-I	4	-	-	4	30	70	100
BTCE706X	Elective-III	4	-	-	3	30	70	100
BTCE707	Industrial Visits /Trainings	-	-		2	100	-	100
	Practical							
BTCE708L	Concrete Technology and Highway Engineering Lab	-	-	4	2	30	70	100
	Total	**24**	**1**	**4**	**26**	**310**	**490**	**800**

List of Electives to be offered in VII Semester

List of Elective II Subjects

1. Experimental Measurements and Analysis (BTCE7041)
2. Geotechnical Processes and Application (BTCE7042)
3. Geographical Information System (BTCE7043)
4. Hydraulic Structures (BTCE7044)
5. Finite Element Analysis (BTCE7045)
6. Advanced Structural Design – RCC (BTCE7046)
7. Failure Analysis and Rehabilitation of Structures (BTCE7047)
8. Ground Water Hydrology (BTCE7048)

List of Elective III Subjects

1. Bridge Engineering (BTCE7061)
2. Hydro Power Engineering (BTCE7062)

3. Site Investigation Methods and Practices (BTCE7063)
4. Highway and Airport Pavement Design (BTCE7064)
5. Matrix methods of structural analysis (BTCE7065)
6. Water Resources System Engineering (BTCE7066)

8th Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE801	Construction Management	4	-	-	4	30	70	100
BTCE802	Disaster Mitigation & Management	4	-	-	4	30	70	100
BTCE803	Design of Steel Structures-II	4	-	-	4	30	70	100
BTCE804X	Elective-IV	4	-	-	4	30	70	100
BTCE805	Seminar	1	-	-	2	100	-	100
BTCE806	Comprehensive Viva Voce	-	-	3	2	-	100	100
BTCE807	Project Work	-	-	12	6	50	50	100
	Total	**17**	**0**	**15**	**26**	**270**	**430**	**700**

List of Electives to be offered in VIII Semester

1. Advanced Structural Design – Steel (BTCE8041)
2. Optimization Techniques for Civil Engineering (BTCE8042)
3. Machine Foundations (BTCE8043)
4. Earth Retaining Structures (BTCE8044)
5. Air and Noise Pollution (BTCE8045)
6. Environmental Impact Assessment (BTCE8046)
7. Dock and Harbor Engineering (BTCE8047)
8. Traffic Engineering and Management (BTCE8048)
9. Photogrammetry and Remote Sensing (BTCE8049)
10. Prefabrication and Construction Techniques (BTCE80410)
11. Earthquake Resistant Design of Structures (BTCE80411)
12. Structural Dynamics (BTCE80412)
13. Theory of Elasticity and Plasticity (BTCE80413)
14. Design of Industrial Structures (BTCE80414)
15. Advanced Open Channel Flow (BTCE80415)

1st Year

1st Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BT 101	Engineering Mathematics-I	3	1	-	4	30	70	100
BT 102	Engineering Physics	4	-	-	4	30	70	100
BT 103	Programming in C	4	-	-	4	30	70	100
BT 104	Elements of Mechanical Engineering	3	-	-	4	30	70	100
BT 105	Basic of Electrical Engineering	3	-	-	4	30	70	100
BT 106	Professional Communication Skill	3	-	-	3	30	70	100
	Practical							
BT 107L	Engineering Physics Lab	-	-	4	2	15	35	50
BT 108L	Programming in C Lab	-	-	4	2	15	35	50
	Total	**20**	**1**	**8**	**27**	**210**	**490**	**700**

ENGINEERING MATHEMATICS-I (BT 101)

Subject Code	**BT101**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Course Objectives:

To enable the students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following:

- nth derivatives of product of two functions and polar curves.
- Partial derivatives
- Vector calculus
- Reduction formulae of integration; to solve First order differential equations.
- Solution of system of linear equations, quadratic forms.

Module - 1

Differential Calculus -1: Determination of n^{th} order derivatives, Leibnitz's theorem (without proof)- problems. Taylor's and Maclaurin's theorems for function of one variable (statement only)- problems. Evaluation of Indeterminate forms.

Partial derivatives – Definition and simple problems, Euler's theorem (without proof) – problems, total derivatives, partial differentiation of composite functions- problems. Definition and evaluation of Jacobian

Hours – 12

Module -2
Differential Calculus -2
Polar Curves - angle between the radius vector and tangent, angle between two curves, Pedal equation of polar curves. Derivative of arc length - Cartesian, Parametric and Polar forms (without proof)- problems. Curvature and Radius of Curvature – Cartesian, Parametric, Polar and Pedal forms (without proof) -problems
Hours - **10**

Module-3
Integral Calculus: Reduction formulae - $\int Sin^n x\, dx, \int Cos^n x\, d, \int Sin^m x\, Cos^n x\, dx$, (m and n are positive integers), evaluation of these integrals with standard limits (0 to $\pi/2$) and problems.
First order Differential Equations: Exact, reducible to exact and Bernoulli's differential equations. Orthogonal trajectories in Cartesian and polar form. Simple problems on Newton's law of cooling.
Hours - **12**

Module-4
Linear Algebra-Rank of a matrix by elementary transformations, solution of system of linear equations - Gauss-elimination method, Gauss–Jordan method and Gauss-Seidel method, Linear transformation, Eigen values and Eigen vectors. diagonalisation of a square matrix. Reduction of Quadratic form.
Hours - **11**

Course outcomes:

- On completion of this course, students are able to
- Use partial derivatives to calculate rates of change of multivariatefunctions.
- Analyze position, velocity, and acceleration in two or three dimensionsusing the calculus of vector valued functions.
- Recognize and solve first-order ordinary differential equations, Newton's law of cooling
- Use matrices techniques for solving systems of linear equations in the different areas of Linear Algebra.

Text Books:

1. B.S. Grewal,**"Higher Engineering Mathematics"**,Khanna publishers, 42nd edition, 2013.
2. Erwin Kreyszig, **"Advanced Engineering Mathematics**I, Wiley, 2013

Reference Books:

1. B.V. Ramana, **"Higher Engineering Mathematics"**, Tata Mc Graw-Hill, 2006
2. N.P. Bali and Manish Goyal, **"A text book of Engineering mathematics"**, Laxmi publications, latest edition.
3. H.K. Dass and Er. Rajnish Verma, **"Higher Engineering Mathematics"**, S.Chand publishing, 1st edition, 2011.

ENGINEERING PHYSICS (BT102)

Subject Code	BT102	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	04

COURSE OBJECTIVES:

The Objective of this course is to make students learn and understand basic concepts and principles of physics to analyze practical engineering problems and apply its solutions effectively and meaningfully. To understand building up of models, design issues, practical oriented skills and problem solving challenges are the great task of the course. To know about shock waves and practical applications is the prime motto to introduce new technology at the initial stage of Engineering.

UNIT-I: Quantum Mechanics

Introduction to quantum physics, Black body radiation, Planck's law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

Hours- 10

UNIT-II: Semiconductor Physics

Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation.

Hours- 10

UNIT-III: Optoelectronics

Radiative and non-radiative recombination mechanisms in semiconductors, LED and semiconductor lasers: Device structure, Materials, Characteristics and figures of merit, Semiconductor photodetectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

Hours- 10

UNIT-IV: Lasers and Fibre Optics

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, He-Ne laser, Applications of laser. Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

Hours- 10

UNIT-V: Electromagnetism and Magnetic Properties of Materials

Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations, Polarisation, Permittivity and Clausius-Mossotti equation, Ferroelectrics and

Piezoelectrics. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials. Dielectric constant, Internal fields in a solid,

Hours- 10

Course outcomes:

On Completion of this course, students are able to –

- Learn and understand more about basic principles and to develop problem solving skills and implementation in technology.
- Gain Knowledge about Modern physics and quantum mechanics will update the basic concepts to implement the skills.
- Study of material properties and their applications is the prime role to understand and use in engineering applications and studies.
- Study Lasers and Optical fibers and its applications are to import knowledge and to develop skills and to use modern instruments in the engineering applications.
- Understand Crystal structure and applications are to boost the technical skills and its applications.
- Expose shock waves concept and its applications will bring latest technology to the students at the first year level to develop research orientation programs at higher semester level.
- Understand basic concepts of nano science and technology.

Text Books:

1. Wiley precise Text, **Engineering Physics,** Wiley India Private Ltd., New Delhi. Book series – 2014,
2. Dr. M.N. Avadhanulu, Dr. P.G.Kshirsagar, Text Book of Engineering Physics**,** S Chand Publishing, New Delhi – 2012

PROGRAMMING IN C (BT103)

Subject Code	**BT103**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

COURSE OBJECTIVES:

1. Design solutions to simple engineering problem by applying the basic programming principles of C language and basic mathematical knowledge.
2. Choose a suitable C-construct to develop C code for a given problem.
3. Recognize the bugs in the C program.
4. Apply the C-language syntax rules to correct the bugs in the C program.
5. Develop simple C programs to illustrate the applications of different data types such as arrays, pointers, functions.

Module 1

Basics of Computer Hardware and Software

Basics of Computer Architecture: processor, Memory, Input& Output devices

Application Software & System software: Compilers, interpreters, High level and low level languages, Introduction to structured approach to programming, Flow chart Algorithms, Pseudo code (*bubble sort, linear search - algorithms and pseudo code*)

Hours- 10

Module 2

Program Basics

Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf

Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence, Preprocessor directive

Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements.(Simple programscovering control flow)

Hours- 10

Module 3

Arrays and strings

Arrays Declaration and Initialization, 1-Dimensional Array, 2-Dimensional Array

String processing:

In built String handling functions (strlen, strcpy, strcat and strcmp, puts, gets). Linear search program, bubble sort program, simple programs covering arrays and strings

Hours- 10

Module 4

Pointers

Basics of Pointer: declaring pointers, accessing data though pointers, NULL pointer, array accessusing pointers, pass by reference effect

Structure & Union

Introduction, Declaration and Initialization, Array of Structures, Unions.

Hours- 15

Module 5

Working with functions

Introduction to modular programming, writing functions, formal parameters, actual parameters Pass by Value, Recursion, Arrays as Function Parameters structure, union, Storage Classes, Scope and life time of variables, *simple programs using functions*

File Handling

File Operations: open, close, read, write, append

Sequential access and random access to files: In built file handling functions (*rewind() ,fseek(), ftell(),feof(), fread(), fwrite()*), *simple programs covering pointers and files.*

Hours- 15

Course outcomes:

After the completion of this course, students will be able to:

CO1: Illustrate and explain the basic computer concepts and programming principles of C language.

CO2: Develop C programs to solve simple mathematical and decision making problems.

CO3: Develop C programs to solve simple engineering problems using looping constructs.

CO4: Develop C programs to demonstrate the applications of derived data types such as arrays, pointers, strings and functions.

Text Books

1. Schaum Series, Gottfried B.S.,Tata McGraw Hill,Programming with C
2. E. Balagurusamy, Mcgraw Hill,Programming in ANSI C
3. Asok N Kamthane, Pearson,Programming in C
4. Anita Goel, Pearson, Computer Fundamentals

Elements of Mechanical Engineering (BT104)

Subject Code	**BT104**	**IA Marks**	30
Number of Lecture Hours/Week	03	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Course objectives:

- Students belonging to all branches of Engineering are made to learn certain fundamental topics related to mechanical engineering so that they will have a minimum understanding of mechanical systems, equipment and process.

Module -1

Energy Resources: Non-renewable and renewable energy resources, Petroleum based solid, liquid and gaseous fuels, Calorific values of fuels, Combustion and combustion products of fuels.

Solar Power: Solar Radiation, Solar constant (definition only), Solar Thermal energy harvesting, ex: liquid flat plate collectors, solar ponds (principle of operation only), Solar photovoltaic principle.

Wind Power: principle of operation of a typical windmill.

Hydro Power: Principles of electric power generation from hydro power plants,

Nuclear Power: Principles of Nuclear power plants,

Bio Fuels: introduction to bio fuels, examples of various biofuels used in engineering applications, Comparison of biofuels with petroleum fuels in terms of calorific value and emission.

Hours- 10

Module- 2

Turbines and IC Engines and Pumps Steam turbines: Classification, Principle of operation of Impulse and reaction turbines, Gas turbines: Classification, Working principles and Operations of Open cycle and closed cycle gas turbines.

Water turbines: Classification, Principles and operations of Pelton wheel, Francis turbine and Kaplan turbine

Internal Combustion Engines: Classification, I.C. Engines parts, 2 Stroke and 4 stroke Petrol engines, 4 stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency, andspecific fuel consumption.

Hours- 10

Module- 3

Machine Tools Operations: Turning, facing, knurling, Thread cutting, Taper Turning , Drilling, Boring, Reaming, Tapping, Counter Sinking, Counter Boring, -Plane milling, End milling, Slot milling. (No sketches of Machine tools, sketches to be used only for explaining operations.)

Hours- 5

Module-4

Engineering materials and joining processes: Engineering Materials: Types and applications of Ferrous & Nonferrous metals and alloys,
Composites: Definition, Classification and applications(Air craft and Automobiles)

Soldering, Brazing and Welding:

Definitions, classification and method of soldering, Brazing and welding. Differences between soldering, Brazing and Welding. Description of Electric Arc Welding and Oxy-Acetylene Welding.

Hours- 10

Module-5

Refrigeration, Air-Conditioning:

Refrigerants: properties of refrigerants, list of commonly used refrigerants. Refrigeration – Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, unit of Refrigeration. Principle and working of vapor compression refrigeration and vapour absorption refrigeration: Principles and applications of air conditioners, Room air conditioner.

Hours- 10

Course outcomes:
Students shall demonstrate knowledge associated with,
CO-1: Various Energy sources, Boilers, Prime movers such as turbines and IC engines, refrigeration and air-conditioning systems
CO-2: Metal removal process using Lathe, drilling, Milling Robotics and Automation.
CO-3: Fair understanding of application and usage of various engineering materials.

Text Books:

1. V.K.Manglik, "Elements of Mechanical Engineering", PHI Publications, 2013. (Module-1,2,4,5)
2. Mikell P.Groover, "Automation, Production Systems & CIM", 3rd Edition, PHI (Module -3)
3. K.R.Gopalkrishna, "A text Book of Elements of Mechanical Engineering"- Subhash Publishers, Bangalore. (Module -1,2,3,4,5)

Basic of Electrical Engineering (BT105)

Subject Code	**BT105**	**IA Marks**	30
Number of Lecture Hours/Week	03	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Course objectives:

- Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
- Provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.
- Develop selection skill to identify the type of generators or motors required for particular application.
- Highlight the importance of transformers in transmission and distribution of electric power.
- Emphasize the effects of electric shock and precautionary measures.
- Improve the ability to function on multi-disciplinary teams.

Module -1

Ohm's law and Kirchhoff's laws, analysis of series, parallel circuit by independent voltage sources, concept of power and energy, definition of magnetic circuit and analogy between electric and magnetic circuits, faradays laws of electromagnetic induction, concept of Network Theorem.

Hours- 10

Module -2

Single Phase A.C. Circuits: Average value, R.M.S. value, form factor and peak factor for sinusoidal wave form, Steady State Analysis of series R-L-C circuits. Concept of Reactance, Impedance, Susceptance, Admittance, Concept of Power Factor, Real, Reactive and Complex power, Illustrative Problems

Hours- 10

Module - 3

Single phase transformers: principle of operation, constructional features and emf equation. DC. Generator: principle of operation, constructional features, emf equation.

DC Motor: principle of operation, Back emf, torque equation.

Hours- 10

Module- 4

Three phase Induction Motor: principle of operation, types; Synchronous Machines: principle of operation of Synchronous generator and motor. EMF equation, Voltage regulation, Applications and starting of Synchronous motor. Introduction to single-phase induction Motor.

Hours- **10**

Module-5

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Types of Wires and Cables, Earthing. Elementary calculations for energy consumption and battery backup.

Measuring Instruments: Construction and Principle of operation of dynamometer type wattmeter and single-phase induction type energy meter

Hours- **10**

Course outcomes:

After the completion of the course, the student should be able

CO-1: To predict the behavior of electrical and magnetic circuits.

CO-2: Select the type of generator / motor required for a particular application.

CO-3: Realize the requirement of transformers in transmission and distribution of electric power and other applications.

CO-4: Practice Electrical Safety Rules & standards.

CO-5: To function on multi-disciplinary teams.

Professional Communication Skill (BT106)

Subject Code	**BT106**	**IA Marks**	30
Number of Lecture Hours/Week	03	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	03

Course Objective:

To enable students how to improve communication skills.

- To develop Writing skills in preparing business letters, report, memos, and proposals. To develop Oratory skills through public speaking
- To understand importance of professional attire in corporate environment.
- To get knowledge on various business etiquette and inculcate the etiquette for corporate fit.

Unit-I: Concepts of Communications

Introduction: Definition and Process of Communication - Forms of Verbal and Non-verbal Communication.

Barriers of Communication: Communication Barriers and Overcoming Communication Barriers - Guidelines for Effective Communication.

Business Writing: Direct and Indirect approaches to Business Writing - Five Main Stages of Writing Business Messages.

Exercise: Role Play, Square Talk Activity.

Hours- **10**

Unit-II: Written Business Communication

External Communication: The Seven C's of Letter writing - Kinds of Business Letters - Business Reports and Proposals - Purpose of Business Reports.

Internal Communication: Format and Principles of Writing Memos - General Warning - Cautions. Exercise: Preparation of Reports on different issues.

Hours- **10**

Unit-III: Oral Communication

Public Speaking: Types of Public Speaking - importance of Public Speaking.

Power Point Presentation: Planning the Presentation - Delivering the Presentation - Developing & Displaying Visual Aids - Handling Questions from the Audience.

Listening: Definition - Types of Listening Skills - Features of a Good Listener - Causes and effects of Poor Listening.

Exercise: Elocution and Extempore

Hours- **10**

Unit-IV: Behavioral Techniques

Body Language: Facial Expressions - Body Posture - Gestures - Eye Movement - Touch and the use of Personal Space.

Business Attire and Grooming: Different types of Attire - Guidelines for Business Attire. Exercise: Power of Body Language, Charades.

Hours- **5**

Unit-V: Etiquettes

Etiquettes: Greeting Etiquette - Corporate Etiquette - Telephone Etiquette - E-mail Etiquette – Meeting Etiquette - Netiquette - Personal Etiquette - Social Etiquette - Dining Etiquette. Exercise: Introduction and Art of Conversation, Telephonic Activity.

Hours- **5**

Course Outcomes:

At the end of the course, the students would be able to:

CO-1: Develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others.

CO-2: Understand and practice different techniques of communication.

CO-3: Practice and adhere to the 7Cs of Communication.

CO-4: Familiarize with different types of Communication.

CO-5: Understand and practice Interview Etiquettes.

TEXT BOOKS:

1. Meenakshi Raman and Prakash Singh, Business Communication, Oxford
2. **Lesikar:** Basic Business Communication, TMH
3. **David Irwin:** Effective Business Communications, Viva- Thorogood. Rajendra Pal, J S Korlaha
4. **HI:** Essentials of Business Communication: Sultan Chand & Sons, New Delhi

2nd SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BT 201	Engineering Mathematics-II	3	1	-	4	30	70	100
BT 202	Engineering Chemistry	4	-	-	4	30	70	100
BT 203	Basic Elements of Civil Engineering and Mechanics	4	-	-	4	30	70	100
BT 204	Computer Aided Engineering Drawing	4	-	-	4	30	70	100
BT 205	Basic Electronics	4	-	-	3	30	70	100
BT 206	Software Engineering	3	1	-	3	30	70	100
	Practical							
BT 207L	Engineering Chemistry Lab	-	-	4	2	15	35	50
BT 208L	Workshop Practice	-	-	4	2	15	35	50
	Total	**22**	**2**	**8**	**26**	**210**	**490**	**700**

Engineering Mathematics-II (BT201)

Subject Code	**BT201**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Course objectives:
To enable students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following

- Ordinary differential equations
- Partial differential equations
- Double and triple integration
- Laplace transform

Module-I

Linear differential equations with constant coefficients: Solutions of second and higher order differential equations - inverse differential operator method, method of undetermined coefficients and method of variation of parameters.

Hours- 10

Module-2

Differential equations-2:

Linear differential equations with variable coefficients: Solution of Cauchy's and

Legendre's linear differential equations.

Nonlinear differential equations - Equations solvable for p, equations solvable for y, equations solvable for x, general and singular solutions, Clairauit's equations and equations reducible to Clairauit's form.

Hours- **10**

Module-3

Partial Differential equations:

Formulation of Partial differential equations by elimination of arbitrary constants/functions, solution of non-homogeneous Partial differential equations by direct integration, solution of homogeneous Partial differential equations involving derivative with respect to one independent variable only.

Derivation of one dimensional heat and wave equations and their solutions by variable separable method.

Hours- **10**

Module-4

Integral Calculus:

Multiple integrals: Beta and Gamma functions: definitions, Relation between beta and gamma functions and simple problems**.**

Evaluation of double and triple integrals. evaluation of double integrals by changing the order of integration and by changing into polar co-ordinates .Applications of multiple integrals to find area and volume.

Hours- **10**

Module-5

Laplace Transform

Definition and Laplace transforms of elementary functions.

Laplace transforms of $e^{at}f(t)$, $t^n f(t)$ *and* $f(t)$ (without proof), t periodic functions and unit-step function- problems

Inverse Laplace Transform

Inverse Laplace Transform - problems, Convolution theorem to find the inverse Laplace transforms (without proof) and problems, solution of linear differential equations using Laplace Transforms.

Hours- **10**

Course outcomes:

On completion of this course, students are able to,

CO-1: Solve differential equations of electrical circuits, forced oscillation of mass springand elementary heat transfer.

CO-2: Solve partial differential equations fluid mechanics, electromagnetic theory andheat transfer.

CO-3: Evaluate double and triple integrals to find area, volume, mass and moment ofinertia of plane and solid region.

CO-4: Use curl and divergence of a vector valued functions in various applications ofelectricity, magnetism and fluid flows.

Text Books:

1. B. S. Grewal," Higher Engineering Mathematics", Khanna publishers, 42nd edition, 2013.
2. Kreyszig, "Advanced Engineering Mathematics " -Wiley, 2013

Reference Books:

1. B.V.Ramana "Higher Engineering M athematics" Tata Mc Graw-Hill, 2006
2. N P Bali and Manish Goyal, "A text book of Engineering mathematics" , Laxmi publications, latest edition.
3. H. K Das and Er. Rajnish Verma ,"Higher Engineering Mathematics", S. Chand publishing,1st edition, 2011.

Engineering Chemistry (BT202)

Subject Code	**BT202**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Course objectives:

To provide students with knowledge of engineering chemistry for building technical competence in industries, research and development in the following fields

- Electrochemistry & Battery Technology.
- Corrosion & Metal Finishing.
- Fuels & Solar energy.
- Polymers.
- Water Technology & Nano Materials.

Module -1

Electrochemistry and Battery Technology

Electrochemistry: Introduction, Derivation of Nernst equation for electrode potential. Reference electrodes: Introduction, construction, working and applications of calomel and Ag / AgCl electrodes. Measurement of electrode potential using calomel electrode. Ion selective electrode: Introduction; Construction and working of glass electrode, determination of pH using glass electrode. Concentration cells: Electrolyte concentration cells, numerical problems.

Battery Technology: Introduction, classification - primary, secondary and reserve batteries. Characteristics - cell potential, current, capacity, electricity storage density, energy efficiency, cycle life and shelf life. Construction, working and applications of Zinc- Air, Nickel- metal hydride batteries. Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.

Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 electrolyte.

Hours- 10

Module -2

Corrosion and Metal Finishing:

Corrosion: Introduction, electrochemical theory of corrosion, galvanic series. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium – pH, conductivity, and temperature. Types of corrosion- Differential metal, differential aeration (Pitting and water line) and stress. Corrosion control: Inorganic coatings-Anodizing of Al and phosphating; Metal coatings-Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods).

Metal Finishing: Introduction, Technological importance. Electroplating: Introduction, principles governing-Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal ion & electrolyte; pH, temperature & throwing power of plating bath; additives- brighteners, levellers, structure modifiers & wetting agents. Electroplating of Nickel (Watt's Bath) and Chromium(decorative and hard). Electro less plating: Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.

Hours- 10

Module – 3

Fuels and Solar Energy:

Fuels: Introduction, classification, calorific value- gross and net calorific values, determination of calorific value of fuel using bomb calorimeter, numerical problems. Cracking: Introduction, fluidized catalytic cracking, synthesis of petrol by Fishcher-Tropsch process, reformation of petrol, octane and cetane numbers., anti knocking agents, power alcohol & biodiesel.

Solar Energy: Introduction, utilization and conversion, photovoltaic cells- construction and working. Design of PV cells: modules, panels & arrays. Advantages & disadvantages of PV cells. Production of solar grade silicon: Union carbide process, purification of silicon (zone refining), doping of silicon-diffusion technique (n&p types).

Hours- 10

Module - 4

Polymers:

Introduction, types of polymerization: addition and condensation, mechanism of polymerization- free radical mechanism taking vinyl chloride as an example. Molecular weight of polymers: number average and weight average, numerical problems. Glass transition temperature (Tg): Factors influencing Tg-Flexibility, inter molecular forces, molecular mass, branching & cross linking and stereo regularity. Significance of Tg. Structure property relationship: crystallinity, tensile strength, elasticity & chemical resistivity. Synthesis, properties and applications of PMMA (plexi glass), Polyurethane and polycarbonate. Elastomers: Introduction, synthesis, properties and applications of Silicone rubber.

Hours- 10

Module-5

Water Technology and Nanomaterials:

Water Technology: Introduction, boiler troubles with disadvantages & prevention methods-scale and sludge formation, priming and foaming, boiler corrosion(due to dissolved O2, CO2 and MgCl2). Determination of DO, BOD and COD, numerical problems on COD. Sewage treatment: Primary, secondary (activated sludge method) and tertiary methods. Softening of water by ion exchange process

Nano Materials: Introduction, properties (size dependent). Synthesis-bottom up approach (sol-gel, precipitation, gas condensation & chemical vapour condensation processes). Nano scale materials-carbon nano tubes, nano wires, fullerenes, dendrimers, nano rods, & nano composites.

Hours- **10**

Course outcomes:

On completion of this course, students will have knowledge in:

CO-1: Electrochemical and concentration cells. Classical & modern batteries and fuel cells.

CO-2: Causes & effects of corrosion of metals and control of corrosion. Modification of surface properties of metals to develop resistance to corrosion, wear, tear, impact etc. by electroplating and electro less plating.

CO-3: Production & consumption of energy for industrialization of country and living standards of people. Utilization of solar energy for different useful forms of energy.

CO-4: Replacement of conventional materials by polymers for various applications.

CO-5: Boiler troubles; sewage treatment and desalination of sea water, and

CO-6: Over viewing of synthesis, properties and applications of nanomaterials.

Text Books:

1. B.S.Jai Prakash, R.Venugopal, Sivakumaraiah & Pushpa Iyengar., **"Chemistry for Engineering Students"**, Subhash Publications, Bangalore.
2. R.V.Gadag & A.Nityananda Shetty., **"Engineering Chemistry"**, I K International Publishing House Private Ltd. New Delhi.
3. P.C.Jain & Monica Jain.,**"Engineering Chemistry"**, Dhanpat Rai Publications, New Delhi.

Reference Books:

1. O.G.Palanna,**"Engineering Chemistry"**,Tata McGraw Hill Education Pvt.Ltd. New Delhi, Fourth Reprint.
2. G.A.Ozin & A.C. Arsenault, **"Nanochemistry A Chemical Approach to Nanomaterials"**, RSC publishing, 2005.
3. **"Wiley Engineering Chemistry"**, Wiley India Pvt. Ltd. New Delhi. SecondEdition.

Basic Elements of Civil Engineering and Mechanics (BT203)

Subject Code	**BT203**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

COURSE OBJECTIVES:

The objectives of this course is to make students to learn basics of Civil Engineering

concepts and infrastructure development, solve problems involving Forces, loads and Moments and know their applications in allied subjects. It is a pre-requisite for several courses involving Forces, Moments, Centroids, Momentof inertia and Kinematics.

Module 1: Introduction to Civil Engineering & Engineering Mechanics
Introduction to Civil Engineering

Scope of different fields of Civil Engineering - Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering.

Infrastructure: Types of infrastructure, Role of Civil Engineer in the Infrastructural Development, Effect of the infrastructural facilities onsocio-economic development of a country. Roads: Classification of Roads and their functions, Comparison of Flexible and Rigid Pavements (Advantages and Limitations)

Bridges: Types of Bridges and Culverts, RCC, Steel and Composite Bridges

Dams: Different types of Dams based on Material, Structural behavior and functionality with simple sketches.

Introduction to Engineering Mechanics: Basic idealizations - Particle, Continuum and Rigid body; Newton's laws-Force and its characteristics, types of forces-Gravity, Lateral and its distribution on surfaces, Classification of force systems, Principle of physical independence, superposition, transmissibility of forces, Introduction to SI units. Couple, Moment of a couple, Characteristics of couple, Moment of a force, Equivalent force - Couple system; Numerical problems on moment of forces and couples, on equivalent force - couple system

Hours- 10

Module 2: Analysis of Concurrent Force Systems
Concepts: Resultants and Equilibrium

Composition of forces - Definition of Resultant; Composition of coplanar - concurrent force system, Parallelogram Law of forces, Principle of resolved parts; Numerical problems on composition of coplanar concurrent force systems.

Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent and non-concurrent force systems.

Application- Static Friction in rigid bodies in contact

Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Numerical Problems on single and two blocks on inclined planes

Hours- 10

Module - 3 Analysis of Non-Concurrent Force Systems
Concepts: Resultants and Equilibrium

Composition of coplanar - non-concurrent force system, Varignon's principle of moments; Numerical problems on composition of coplanar non-concurrent Force system.

Application-Support Reaction in beams

Types of Loads and Supports, statically determinate beams, Numerical problems onsupport reactions for statically determinate beams with Point load (Normal and inclined) and uniformly distributed and uniformly varying loads and Moments.

Hours- 10

Module 4 Centroids and Moments of Inertia of Engineering Sections:

Centroids

Introduction to the concept, centroid of line and area, centroid of basic geometrical figures, computing centroid for–T,L,I,Z and full/quadrant circular sections and their built up sections. Numerical problems

Moment of Inertia

Introduction to the concept, Radius of gyration, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia of basic planar figures, computing moment of Inertia for – T, L, I, Z and full/quadrant circular sections and their built up sections. Numerical problems

Hours- 10

Module 5: Kinematics

Concepts and Applications

Definitions – Displacement – Average velocity – Instantaneous velocity – Speed – Acceleration - Average acceleration – Variable acceleration – Acceleration due to gravity – Newton's Laws of Motion.

Rectilinear Motion–Numerical problems.

Curvilinear Motion – Super elevation – Projectile Motion – Relative motion – Numerical problems.

Motion under gravity – Numerical problems.

Hours- 10

Course outcomes

After a successful completion of the course, the student will be able to:

CO-1: Know basics of Civil Engineering, its scope of study, knowledge about Roads, Bridges and Dams;

CO-2: Comprehend the action of Forces, Moments and other loads on systems of rigid bodies;

CO-3: Compute the reactive forces and the effects that develop as a result of the external loads;

CO-4: Locate the Centroid and compute the Moment of Inertia of regular cross- sections.

CO-5: Express the relationship between the motion of bodies and

CO-6: Equipped to pursue studies in allied courses in Mechanics.

TEXT BOOKS

1. Elements of Civil Engineering and Engineering Mechanics by M.N. Shesha Prakash and Ganesh. B. Mogaveer, PHI Learning, 3rd Revised edition (2014)
2. Engineering Mechanics-Statics and Dynamics by A Nelson, Tata McGraw Hill Education Private Ltd, New Delhi, 2009.
3. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition 2009.

REFERENCES

1. Engineering Mechanics by S.Timoshenko, D.H.Young, and J.V.Rao, TATA McGraw-Hill Book Company, New Delhi
2. Beer FP and Johnson ER, "Mechanics for Engineers- Dynamics and Statics"- 3rd SI Metric edition, Tata McGraw Hill. - 2008

Computer Aided Engineering Drawing (BT204)

Subject Code	**BT204**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Course objectives:

- Engineering drawing is an important tool for all Engineers and for many others professionals. It is the language of Engineers. Engineering Drawing communicates all needed information from the engineer who designed a part to the workers who will manufacture it.
- The aim of the subject is to equip students with the fundamentals of Computer Aided Engineering Drawing and to further the ability to communicate information by graphical means.

Module -1

Introduction to Computer Aided Sketching

Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. of HP, VP, RPP & LPP. of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering.

Hours- 10

Module -2

Orthographic projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems).Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates).

Hours- 10

Module-3

Projections of Solids (First angle Projection only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions (No problems on octahedrons and combination solid).

Hours- 5

Module-4

Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on sections of solids)

Development of lateral surfaces of above solids, their frustums and truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces).

Hours- 5

Module-5

Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of three solids).

Hours- 10

Course outcomes:

After studying this course,

CO-1: Students will be able to demonstrate the usage of CAD software.

CO-2: Students will be able to visualize and draw Orthographic projections, Sections of solids and Isometric views of solids.

CO-3: Students are evaluated for their ability in applying various concepts to solvepractical problems related to engineering drawing.

TEXT BOOKS:

1. Engineering Drawing – N.D. Bhatt & V.M. Panchal, 48th edition, 2005 Charotar Publishing House, Gujarat.

2. "Computer Aided Engineering Drawing"by Dr. M H Annaiah, Dr C N Chandrappa and Dr B Sudheer Premkumar Fifth edition, New Age International Publishers

REFERENCE BOOKS:

1. Computer Aided Engineering Drawing – S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition-2006.

2. Engineering Graphics - K.R. Gopalkrishna, 32nd edition, 2005- Subash Publishers Bangalore.

Basic Electronics (BT205)

Subject Code	BT205	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	45	CREDITS	03

Course Objectives:

- To study in detail about construction of several electronic devices.
- To analyse the characteristics of various electronic devices and circuits.
- To understand the internal structure and characteristics of Op-amp.

- To learn about the linear and non-linear applications of Op-amp.

UNIT – I: Semi Conductors and Diodes:

Conductors, Semiconductors, Intrinsic Semiconductors, Extrinsic Semi-Conductors. Diode Theory: Basic Ideas, The ideal Diode, Forward and Reverse Bias, Diode Equation, Volt-Ampere Characteristic. Special diodes: symbol of zener diode, operation, V-I characteristics, symbol of photo diode, working principle, LED symbol and principle.

Hours- 10

UNIT – II: Rectifiers:

Half-wave Rectifier, Full-wave and Bridge Rectifier, derivation of Ripple factor, efficiency of Half-wave, full-wave and Bridge rectifiers. Merits and demerits of Half-wave, full-wave and Bridge rectifiers, Comparisons of rectifiers.

Hours- 10

UNIT- III: Bipolar Junction Transistors:

Symbols of pnp and npn transistors and their working principles, Transistor currents, input and output characteristics of Common base configuration, Common Emitter configuration Transistor Switch, Amplifiers: working principles of Common base amplifier, Common Emitter amplifier, Common collector amplifier and their applications.

Hours- 10

UNIT- IV Characteristics of Op-Amps:

Introduction to OP-amp, Op-amp Block Diagram, ideal and practical Op-amp specifications, 741 op-amp & its features, Op-Amp parameters & Measurement, Input & Out put off set voltages & currents, slew rates, CMRR, PSRR.

Hours- 7

UNIT-V: Applications of Op-Amps:

Inverting and Non-inverting amplifier, Integrator and differentiator, Comparators.

Hours- 3

Course Outcomes:

Students will be able to

CO-1: Understand the semiconductor physics of the intrinsic, p and n materials.
CO-2: Understand the function and operation of diodes, transistors and amplifiers.
CO-3: Students will be aware of the architecture, functions & their applications of IC 741 OP-Amp

Text Books:

1. Electronic Principles, Albert Malvino and David J Bates, 7th Edition, Tata McGraw –Hill.
2. Electronic Devices and Circuits Theory, Boyelstad, Pearson Education, 8th Edition, September 2011.
3. Op-Amps and Linear Integrated Circuits , - Ramakanth A. Gayakwad, PHI, 4th Edition, 2009

4. Linear Integrated Circuits – D. Roy Chowdhury, New Age International Pvt.Ltd., 2nd Edition, 2003.

Software Engineering (BT206)

Subject Code	BT206	IA Marks	30
Number of Lecture Hours/Week	03	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	03

Course Objectives:

- Understand the software life cycle models
- Understand the importance of the software development process
- Understand the importance of modeling and modeling languages
- Design and develop correct and robust software products

Unit-I

Introduction:

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Hours- 10

Unit-II

Software Requirement Specifications (SRS) Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Hours- 10

Unit-III

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Hours- 10

Unit-IV

Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Hours- 10

Unit-V

Software Maintenance and Software Project Management Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Hours- 10

Course Outcomes:

At the end of the course the student should be able to:

CO 1: Identify the need for engineering approach to software development and various processes of requirements analysis for software engineering problems.

CO 2: Analyze various software engineering models and apply methods for design and development of software projects.

CO 3: Work with various techniques, metrics and strategies for Testing software projects.

CO 4: Identify and apply the principles, processes and main knowledge areas for Software Project Management

CO 5: Proficiently apply standards, CASE tools and techniques for engineering software projects

Text books:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

4. Pankaj Jalote, Software Engineering, Wiley 5.Deepak Jain,"Software Engineering:Principles and Practices", Oxford University Press.

List of experiment

1. To determine the surface tension of a given sample liquid at room temperature using stalagmometer by drop number method.
2. Determination of the viscosity of the given sample liquid.
3. Determination of hardness of water by EDTA method.
4. Estimation of Fe2+ in Mohr's salt using permanganometry.
5. Qualitative analysis of given salt – 1.
6. Qualitative analysis of given salt – 2.
7. Synthesis of Bakelite.
8. To determine the electrochemical equivalence (E.C.E.) of Cu with the help of CuSO4 and Cu-electrode.
9. Determination of chloride concentration in a sample of water.
10. Determination of flash and fire points in lubricating oil using pensky-marten's closed-cup apparatus.

2nd Year
3rd Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE301	Engineering Mathematics-III	3	1	-	4	30	70	100
BTCE302	Building Material	4	-	-	3	30	70	100
BTCE303	Building Construction	4	-	-	3	30	70	100
BTCE304	Strength of Material-I	4	-	-	4	30	70	100
BTCE305	Fluid Mechanics	3	1	-	4	30	70	100
BTCE306	Surveying-I	4	-	-	4	30	70	100
	Practical							
BTCE307L	Surveying lab-I	-	-	4	2	30	70	100
BTCE308L	Strength of Material Lab	-	-	4	2	30	70	100
	Total	**23**	**2**	**8**	**26**	**240**	**560**	**800**

ENGINEERING MATHEMATICS - III (BTCE301)

Subject Code	**BTCE301**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

UNIT – I

VECTOR DIFFERENTIATION

Scalar and vector point functions – Del applied to scalar point functions – Directional derivative – Del applied to vector point functions – Physical interpretation of divergence and curl – Del applied twice to point functions – Del applied to products of point functions.

Hours-10

UNIT – II

VECTOR INTEGRATION

Integration of vectors – Line integral, circulation, work done – Surface integral, flux – Green's theorem in the plane – Stoke's theorem – Volume integral – Gauss divergence theorem (all theorems without proofs) – Irrotational and solenoidal fields.

Hours-10

UNIT – III

PARTIAL DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS

Introduction – Formation of partial differential equations by eliminating arbitrary constants and functions – Solutions of a partial differential equations by direct Integration – Linear equations of the first order (Lagrange's linear equations).

Applications: Method of separation of variables – Vibrations of a stretched string: Wave equation
– One dimensional heat flow equation ($\partial u/\partial t=c^{2} (\partial^2 u)/(\partial x^2)$), and two dimensional heat flow equation (i.e. Laplace equation : $(\partial^2 u)/(\partial x^2)+(\partial^2 u)/(\partial y^2)=0$).

Hours-10

UNIT – IV

FOURIER SERIES

Introduction – Euler's formulae – Conditions for a Fourier expansion – Functions having points of discontinuity – Change of interval – Even and odd functions – Half range series – Parseval's formula.

Hours-10

UNIT – V

FOURIER TRANSFORMS

Introduction – Definition – Fourier integral theorem (without proof) - Fourier sine and cosine integrals – Fourier transforms – Properties of Fourier transforms – Convolution theorem – Parseval's identity for Fourier transforms – Relation between Fourier and Laplace transforms
– Fourier transforms of the derivatives of a function – Applications of transforms to boundaryvalue problems.

Hours-10

Text Books

1. Venkataraman M.K., Engineering Mathematics, Vol. II The National PublishingCompany, Madras (2009) (For Units I, II and III)
2. Venkataraman M.K., Engineering Mathematics, Vol. III The National PublishingCompany, Madras (2009) (For Units IV and V)

Reference Books

1. Bali N.P. & Manish Goel, A Text Book of Engineering Mathematics, Laxmi Publications,New Delhi 2008.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd. (2005).
3. Grewal B.S, Higher Engineering Mathematics, Khanna Publishers, Delhi (2008).

BUILDING MATERIALS (BTCE302)

Subject Code	BTCE302	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	03

Unit-I

Bricks – classification and testing of bricks-Fire bricks-Building blocks- solid, hollow and paving blocks- types and applications. Lime –types and applications. Pozzolanic materials – fly ash, rice husk ash and GGBFS – Industrial wastes for concrete making.

Unit-II

Tiles – ceramic, terrazzo and clay tiles – types and uses. Materials of finish for residential, commercial and industrial floors. Materials of wall finish – interior and exterior. Wall paneling materials. Materials for architectural finishes.

Unit-III

Materials for building services-Timber-Market forms-Industrial Timber-Plywood Veneer- Thermo Cole-Panels of laminates-Steel-composition-Uses-Market forms-Mechanicall Treatment- Aluminium and plastics - Paints-Varnishes-Distemper

Unit IV

Pavement Grade bitumen – Asphalt - cut back bitumen - Bituminous Emulsion - Mastic Bitumen - Bituminous felt – Joint filler compound – Joint sealant compound – Anti-stripping compound – Polymer modified bitumen – Latex modified bitumen – crumb rubber modified bitumen

Unit-V

Glass-Ceramics-Sealants for joints-Sheets for pitched roof coverings-Fibre glass reinforced plastic-Clay products-Refractories –Composite materials-Types-application of laminar composites-Fibre textiles- Mats and pads for earth reinforcement-Polymers and resins forbuilding repair.

Text Books

1. Surendra Singh, Building Materials, Vikas Publishing Company, New Delhi, 2002.

2. Rajput,R.K., Engineering Materials, S.Chand & Co. Ltd., New Delhi,

2000.Reference Books

1. Khanna, S.K., Justo, C.E.G, Highway Engineering, Nem Chand & Bros, Roorkee, 2007.

2. Kadiyali, L. R, Highway Engineering, Khanna Publishers, New Delhi, 2007

BUILDING CONSTRUCTION (BTCE303)

Subject Code	BTCE303	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	03

Unit-I

Introduction-basic functions of building-building component and their basic requirements.

Foundation-need for foundation-Concept of bearing capacity-types of foundation-recommended foundation for different soils.

Unit –II

Masonry construction- Stone masonry –types. Brick masonry-bonds-types. hollow block masonry-reinforced masonry-composite masonry.

Walls-types and their uses. Floors and roofs-different types of floors and their suitability. floor finishes- Roofs-different types of flat, pitched and curved roofs- roof coverings.

Unit-III

Vertical transportation-stair cases-types- layout design. Lifts-ramps – escalators. Doors and windows-location and size specifications-types-fixtures and fastenings for doors and windows-ventilators.

Unit –IV

Building finishes-plastering-methods and types- special external finishes for plastered surfaces- defects in plastering- pointing- white washing-colour washing – painting, varnishing and distempering. Proofing for dampness and fire-anti termite protection.

Unit –V

Temporary structures- form work-scaffolding- shoring-underpinning. Acoustics of buildings – sound absorbent material and sound insulation Ventilation, air conditioning and thermal insulation-functional requirement of ventilation system-system of ventilation and their choice. Air conditioning-purposes and classification- systems of air conditioning. Thermal insulation-principles-heat insulating materials and methods of heat insulation

Text Books

1. Arora . S.P. Bindra S.P . A Test of Building Construction, Dhanpat rai & Sons, New Delhi,2002.
2. Punmia, B.C, Building Construction, Lakshmi Publications Pvt. Ltd., New Delhi, 2002.

Strength of Material-I (BTCE304)

Subject Code	BTCE304	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	04

Unit -I

Simple Stresses and Strains – Tension, compression and shear stresses - Hooke's law - compound stresses - thermal stresses – Compound bars. Analysis of trusses by methods of joints and sections.

Unit -II

Shear force and bending moment diagrams for beams and simple frames - Theory of simple bending – Bending stress distribution at sections.

Unit -III

Theory of simple Torsion – Torsional rigidity – Composite shafts in series and parallel. Thincylinders and shells – Thick cylinders.

Unit-IV

Shear stress distribution due to bending – Shear center. Springs – Closed and open coiled springs – Leaf springs. Complex stresses – Principal planes and stresses-Mohr's circle.

Unit -V

Columns – Euler's theory – Rankine – Jordon formula – Columns with initial curvature and eccentric loads –Long columns- Laterally loaded columns. Masonry dams and retainingwalls – Middle Thrird rule – Stability Check.

Text books

1. Bhavikatti. S. S., Strength of Materials, Vikas Publishing House (P) Ltd., New Delhi, SecondEdition, 2002.
2. Punmia. B. C., Jain, A. K., and Jain, A. K., Strength of Materials and Theory of Structures,Vols. I & II, XI Edition, Laxmi Publications (P) Ltd, New Delhi, 2002.
3. Hearn, E. J., Strength of Materials, Pergamon Press, Oxford, 1997.

FLUIDS MECHANICS (BTCE305)

Subject Code	BTCE305	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	04

Unit - I

Fluid Properties: Density, specific weight, specific volume, specific gravity, compressibility, viscosity, surface tension, capillarity, vapour pressure. Fluid Statics: Pressure in a fluid, pressure head, Measurement of pressure, Hydrostatic forces on submerged plane and curved surfaces, Buoyancy, Metacentre, stability of floating and submerged bodies.

Unit-II

Fluid Kinematics: Stream line, streak line, Path line and stream tube. Types of flow, steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows. Equation of continuity for one, two, three dimensional flows, Stream function and velocity potential function, flow net analysis,.

Dynamics of Flow: Euler's equation of motion, Bernoulli's equation, simple applications of Bernoulli's equation, Momentum equation. Kinetic energy and Momentum correction factors.

Unit - III

Boundary Layer Theory:; Boundary Layer thickness, Displacement thickness, Momentum thickness, Energy thickness, Boundary layer growth and separation. Laminar flow: Laminar flow through pipes, Hagen - poissuille flow, energy loss. Turbulent flow: Turbulent flow through pipes, Darcy's equation, Minor losses, Energy and hydraulic gradients, pipes in series and parallel.

Unit- IV

Flow measurement: Pitot tube, Venturimeter, orificemeter, Flow nozzle, and mouthpieces, flow over notches and weirs, Venturiflume and Standing wave flume, Velocity measurement in open channel.

Unit – V

Dimensional Analysis and Similitude: Dimensional analysis - Rayleigh's method, Buckingham's fi theorem, Dimensionless numbers, Laws of similitude, Model Analysis, Distorted models, Principles of analogy.

Text Books

1. Modi, P.N., and Seth, S.M., Hydraulics, Fluid Mechanics and Hydraulic Machines,Standard Book Home, New Delhi, 2005.
2. Rajput,R.K., Text Book of Fluid Mechanics and Hydraulic Machinery, S.Chand &Company, Ltd., New Delhi, 2005.

Reference Books

1. Douglas, J.F., Gasiorek, J.M and Swaffield, J.A., Fluid Mechanics 4th Edn. PearsonEducation India, 2002.
2. Das M.M Fluid Mechanics and Turbimachines , Prentice Hall of India (P) Ltd New Delhi, 2008.
3. Arore, K.R Fluid Mechanics, Hydraulic and Hydraulic Machines , Standard Publishersand Distributors , New Delhi , 2005

SURVEYING-I (BTCE306)

Subject Code	BTCE306	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	04

Unit –I

Introduction

Definition–classification-principles –Accuracy and errors–Linear measurements–methods–ranging out survey lines -chaining–Error due to incorrect chain–chaining on uneven or sloping ground–Error in chaining–Tape correction Chain surveying–arrangements of survey lines –locating ground features –Field book–field work – Basic problems in chaining - Obstacles in chaining

Unit –II

Compass surveying – Basic terms and definitions–Bearing and angles- compass –types - Magnetic declination –Dip-Traversing - Local attraction

plane table surveying-Plane table instruments and accessories- merits and demerits-methods- intersection - traversing–resection–Three point problem–Two point problem–Errors in plane tabling–Advantages and Disadvantages of Plane Tabling

Unit –III

Leveling and applications

Basic terms and definitions – Methods of leveling – levels and staves- temporary and permanent adjustments –Direct levelling – Differential leveling - booking and reducing Levels – Balancing of sights-curvature and refraction- reciprocal leveling-longitudinal and cross sections- traversing –Levelling problems – errors in Levelling Contouring – methods –characteristic and use of contours – plotting

Unit –IV

Traversing – Basic terms and definitions-Chain and compass traversing –checks in closed traverse – plotting a traverse –coordinate systems – closing errors – balancing a traverse – degree of accuracy in traversing

omitted measurements- cases

Unit- V

Areas and Volumes-Areas enclosed by straight lines – Irregular figures – volume – earthwork calculations – capacity of reservoirs – mass – haul diagrams. Setting out works-introduction – Controls for setting Out – Horizontal Control – Vertical Control – Setting Out in Vertical Direction – Positioning of Structure – Setting Out Foundation Trenches of Building

Text Books

1. Punmia . B.C . , etc . al..” Surveying “, Vols, I,II and III, Laxmi Publications, 2002
2. Kanetkar, T.P. ,Surveying and leveling, Vols. I & II, United book corporation, Pune.

SURVEYING LAB- I (BTCE307L)

1. Study of various instruments used in chain surveying.
2. To conduct the chain survey closed traverse around a building and plot the existing building.
3. To run a survey line across an obstacle obstructing both ranging and chaining using chainsurvey technique.
4. To find the horizontal distance between two inaccessible points.
5. To plot the plan of a given area by compass traversing
6. To draw the position in plan of the given points by radiation method.
7. To draw the position in plan of the given points by intersection method.
8. To locate the position on the plan, of the station occupied by the plane table by means of observations to two well defined points whose positions have been previously plotted on the plan.
9. To locate the position on the plan, of the station occupied by the plane table by means of observations to three well defined points whose positions have been previously plotted on the plan.
10. To survey a small piece of land by closed traverse technique using plane table.
11. To find the reduced levels of the given stations by differential leveling.
12. To plot the longitudinal section and cross section along a proposed alignment of a highway.

STRENGTH OF MATERIAL LAB (BTCE308L)

1. To determines water absorption of brick.
2. To determine the shape and size of the supplied brick.
3. To determines the compressive strength of bricks.
4. To determines the efflorescence of bricks.
5. This test method covers the determination of the normal consistency of Hydraulic cement. That is by determining the amount of water required to prepare Cement pastes for Initial and final time of setting test.
6. This test covers determination of the time of Setting of cement by means of the Vicat needle.
7. This test method covers determination of the compressive strength of cement mortars, using *2* in (50 mm) cube specimens.
8. This test method covers determination of the finesses of hydraulic cement by means of the 150μm (No.100) and 75μm (No.200) sieves.
9. To determine the soundness of the given sample of cement by "Le-Chatelier" method.
10. To determine crushing strength of a given aggregate as per IS:2386 part – IV.
11. To determine the aggregate impact value of given aggregate as perI.S-2386 Part

IV.

12. This test method covers the determination of Bulk and Apparent Specific Gravity and Absorption of fine aggregate.
13. This method covers the determination of the particle size distribution the fine and coarse aggregate by sieving.
14. To ascertain the bulking phenomena of given sample of sand.

4th Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE401	Engineering Mathematics –IV	3	1	-	4	30	70	100
BTCE402	Concrete Technology	4	-	-	3	30	70	100
BTCE403	Engineering Geology	4	-	-	3	30	70	100
BTCE404	Strength of Material-II	3	-	-	4	30	70	100
BTCE405	Hydraulics and Hydraulics Machinery	3	1	-	4	30	70	100
BTCE406	Surveying-II	4	-	-	4	30	70	100
	Practical							
BTCE407L	Surveying lab-II	-	-	4	2	30	70	100
BTCE408L	Engineering Geology Lab	-	-	4	2	30	70	100
	Total	**22**	**2**	**8**	**26**	**240**	**560**	**800**

ENGINEERING MATHEMATICS- IV (BTCE401)

Subject Code	**BTCE401**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

UNIT – I: FUNCTIONS OF A COMPLEX VARIABLE

Introduction – Limit of a complex function – Derivative of (z) – Analytic functions – Harmonic functions – Applications to flow problems. Complex Integration – Cauchy's theorem – Cauchy's integral formula – Series of complex terms (Statements of Taylor's and Laurent's Series without proof) – Zeros of an analytic function – Residues – Calculation of residues – Evaluation of real definite integrals (Integration around the unit circle, Integration around the small semi-circle

, Indenting the contours having poles on the real axis).

Geometric representation of (z), Some standard transformations ($= z + c, w = cz, w = \frac{1}{z}$, $w = \frac{az+b}{cz+d}$). **15 Hours**

UNIT – II: FINITE DIFFERENCES & INTERPOLATION

Finite differences – Forward differences – Backward differences – Central differences – Differences of a polynomial – Factorial notation – Other difference operators – To find one or more missing terms – Newton's interpolation formulae – Central difference interpolation formulae – Interpolation with unequal intervals – Lagrange's interpolation formula – Inverse interpolation. **15 Hours**

UNIT – III: NUMERICAL DIFFERENTIATION AND INTEGRATION

Numerical differentiation – Formulae for derivatives – Maxima and minima of a tabulated function – Numerical integration – Newton-Cotes quadrature formula – Trapezoidal rule – Simpson's $\frac{1}{3}^{rd}$ –rule , Simpson's $\frac{3}{8}^{th}$ –rule.

Hours-10

UNIT – IV: Z – TRANSFORMS

Introduction – Definition – Some standard Z-transforms – Linearity property –Damping rule – Some standard results – Shifting U_n to the right, Shifting U_n to the left – Two basic theorems (Initial value theorem and Final value theorem) – Convolution theorem – Convergence of Z-transforms – Two sided Z-transform of U_n – Evaluation of inverse Z-transforms (Power series method, Partial fraction method, Inverse integral method) – Applications to difference equations.

Hours-10

UNIT – V:SAMPLING THEORY

Introduction – Sampling distribution – Testing a hypothesis – Level of significance -Confidence limits – Test of significance of large samples (Test of significance of single mean, difference of means) – Confidence limits for unknown – Small samples – Students t-distribution

-Significance test of a sample mean – Significance test of difference between sample means – Chi-Square (χ^2) Test – Goodness of fit.

Hours-10

Text Books

1. Venkataraman M.K., Engineering Mathematics, Vol II & III, The National PublishingCompany, Madras (2007).
2. Gupta C . and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chandand Sons, New Delhi (2008).

Reference Books

1. Bali N.P. & Manish Goel, A Text Book of Engineering Mathematics, Laxmi Publications,
2. New Delhi 2008.
3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd. (2005).
4. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, Delhi (2008).

CONCRETE TECHNOLOGY (BTCE402)

Subject Code	BTCE402	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	03

Unit –I

Portland cement – chemical composition – hydration of Portland cement – heat of hydration – hardening of cement paste – types of Portland cement – special hydrauliccements.

Unit – II

Aggregates – natural and mineral aggregates – characteristics of aggregate and their significance – testing of aggregates – admixtures for concrete – concrete at early ages – workability of concrete – early volume changes – setting time.

Unit – III

Concrete – introduction – components of concrete – types – properties of hardened concrete and their significance, structure of the hardened concrete - Compressive strength of concrete and factors affecting it – elastic behaviour of concrete – drying shrinkage and creep.

Unit – IV

Durability of concrete – significance – causes of concrete deterioration – alkali-aggregate reaction – deterioration by chemical actions – concrete in marine environment.

Unit – V

Concept of proportioning concrete mixes – mix design – IS code method – ACI method. Testing, evaluation and control of concrete quality.

Text Books

1. Mehta, K.P., Concrete – microstructure, properties and materials, TMH, 2008.
2. Shetty,M.S. , Concrete Technology, Chand & Co., New

Delhi,2006.Reference Books

1. Gambhir,M.L., Concrete Technology, Tata McGraw Hill Co., New Delhi,2002
2. Neville,A.M. , Properties of Concrete, Longman, Indian reprint 2000.
3. Neville,A.M.& Brooks J.J., Concrete Technology, Pearson Education, Indian reprint 2002.
4. 4.Krishnaraju,N., Design of Concrete Mixes, CBS Publishers , New Delhi,2002.
5. IS : 10262-1982, Recommended Guidelines for Concrete Mix Design, BIS, NewDelhi.

ENGINEERING GEOLOGY (BTCE403)

Subject Code	BTCE403	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	03

Unit-I

General Geology: Scope of geology in Civil Engineering - the earth, its structure and environment - physiographic, stratigraphic and tectonic divisions of India - geomorphological (surface) processes – weathering – types , weathered products, assessment of degree of weathering , Fluvial processes, glaciation, wind action, and their significance in Civil Engineering – earthquake, its causes, classification, earthquake zones of India, Geological considerations for construction of buildings.

Unit-II

Mineralogy: Physical properties of minerals – classification - study of important rock forming minerals – Quartz family, feldspar family, Augite, Hornblend, Mica family, calcite, Iron oxide minerals, Augite, Hornblend, and Clay minerals and their behaviour and significance in the field of Civil Engineering.

Unit-III

Petrology: Classification of rock - mode of formation - distinction between igneous, sedimentary and metamorphic rocks - Physical and Mechanical properties of rocks-. Study of important rocks - granite, syenite, diorite, gabbro, pegmatite, dolerite , basalt , sand stone, limestone, shale, breccia , conglomerate , gneiss, quartzite, marble, slate, schist, phyllite and conglomerate - role of petrology in the field of construction.

Unit-IV

Structural Geology and Geophysical methods: Attitude of beds - out crops, study of structures such as folds, faults, joints, unconformities in lier and out lier their brief classification and their bearing on engineering construction – principles of geophysical methods, electrical resistivity method , seismic method and its applications in civil engineering.

Unit-V

Geology and construction: Role of geology in site investigation, Geotechnical classification of rock, geological considerations in open excavation, tunnels and dam site, reservoir site, buildings, road cuttings, study of air photographs and satellite images and interpretation for civil engineering projects, landslides-its causes, classification and preventive measures, groundwater- types of aquifers , properties of geological formations affecting groundwater and its role as a geological hazard.

Text Books

1. Parbin Singh,"Engineering and General Geology ", Katson Publications House, 2001.

2. Venkata Reddy,D.," Engineering Geology for Civil Engineers", Oxford & IBH ,

1995

Reference Books

1 Leggot, R.F.," Geology and Engineers ", McGraw Hill , New York.2002
2 Blyth, F.G.M., " A Geology for Engineers", Arnold, Londo,(2003.
3 Bell.F.G," Fundamentals of Engineering Geology" Butterworth, 1983.

Strength of Material-II (BTCE404)

Subject Code	BTCE306	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	04

Unit – I

Deflection of beams – Macaulay's method, moment area method -conjugate beam Methods.

Unit – II

Strain energy due to axial, bending, shear and torsional forces – Impact loads. Principle of virtual displacement – principle of minimum potential energy –Castigliano's Theorems –Maxwell – Betti's theorem.

Unit – III

Deflection of trusses and frames – strain energy and dummy/unit load methods.

Unit – IV

Analysis of continuous beams using generalized theorem of three moments – shear force and bending moment diagrams. Unsymmetrical bending – principal moments of inertia – stresses due to unsymmetrical bending.

Unit – V

Complex strains – linear strains for tri-axial state of stress – principle strains in terms of stress – Mohr's strain circle – relationship between Mohr's strain and stress circles – Rosetteanalysis. Theories of failure – Brittle and Ductile materials.

Text Books

1. Bhavikatti. S. S., Strength of Materials, Vikas Publishing House (P) Ltd., New Delhi,Second Edition, 2002.
2. Bhavikatti. S. S., Structural Analysis – I, Vikas Publishing House (P) Ltd., New Delhi,Second Edition, 2002.
3. Punmia. B. C., Jain, A. K., and Jain, A. K., Strength of Materials and Theory ofStructures, Vols. I & II, XI Edition, Laxmi Publications (P) Ltd, New Delhi, 2002.

HYDRAULICS AND HYDRAULIC MACHINERY (BTCE405)

Subject Code	BTCE405	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	04

Unit – I

Open Channel flow: Types of flow, Types of Channel, Velocity distribution, Chezy,Manning and Basin formulae, for uniform flow, Most economical section , critical flow
,Specific energy, specific force. Computation of uniform flow and critical flow.

Unit-II

Open channel flow: Non-Uniform flow, Dynamic equation for Gradually varied flow, computation for length of backwater curve, Rapidly Varied flow - hydraulic jump, types,uses. Surges in open channels.

Unit-III

Basics of Turbo machinery: Impulse momentum equation, Hydrodynamic forces of jets on vanes, velocity Triangles, Angular momentum principle, application to radial flow turbines.

Unit-IV

Turbines: Classification, impulse and reaction turbines, characteristic curves, draft tubes, governing of turbines, specific speed, unit quantities concept, similarity, cavitation,

Unit-V

Pumps: Centrifugal pumps - classification, work done, minimum starting speed, lossesand efficiencies, specific speed, multistage pumps, specific speed, characteristic curves, NPSH, Cavitation in pumps. Reciprocating pumps - types, effects of acceleration and frictional resistance, separation, Air vessels, work saved by fitting air vessels.

Text Books

1. Modi, P.N., and Seth, S.M., Hydraulics, Fluid Mechanics and Hydraulic Machines,Standard Book Home, New Delhi, 2005.
2. Rajput,R.K., Text Book of Fluid Mechanics and Hydraulic Machinery, S.Chand &Company, Ltd., New Delhi, 2005.

Reference Books

1. Douglas, J.F., Gasiorek, J.M and Swaffield, J.A., Fluid Mechanics 4th Edn. PearsonEducation India, 2002.
2. Das M.M Fluid Mechanics and Turbimachines , Prentice Hall of India (P) Ltd New Delhi, 2008.
3. Arore, K.R Fluid Mechanics, Hydraulic and Hydraulic Machines , Standard

Publishersand Distributors , New Delhi , 2005

SURVEYING-II (BTCE406)

Subject Code	**BTCE406**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Unit-I

Theodolites description and uses- temporary and permanent adjustments of Theodolite – horizontal angles – vertical angles –Trignometrical Levelling –Base of the Object Accessible – Inaccessible :for instruments at same and different plane of observation

Unit-II

Tacheometric surveying –Principle of stadia measurement –Basic systems of tacheometric measurement - Determination of Tacheometric measurements – subtense bar – Errors in tacheometry

Unit-III

Setting out curves: Horizontal curves – Elements of a circular curve and notations – Designation of a curve – Setting out a simple circular curve – Compound curve – Reverse curve – Transition – vertical curve .

Unit-IV

Horizontal and vertical control, triangulation - Classification of triangulation system, network, signals, satellite stations - base line measurement - corrections, extension of base- Theory of error and adjustments - true and most probable value, residual error, weighted observation, principle of least square, normal equations, correlatives, adjustment of simple triangulation figure, station and figure adjustment

Unit-V

Hydrographic surveying – shore line measurement, soundings – tides and tide gauge – Mine surveying- Equipment for Mine survey- station and station markers – measurement of distance and difference in elevation- Introduction to– EDM and total station – Remote sensing – GIS

Text Books

1. Punmia,B.C., Surveying, Vol I & II, Laxmi Publications, 1998.
2. Duggal, S.K., Surveying, Vol.I & II, TMH Publications, 2000.

Reference Books

1. Kanetkar, T.P., and Kulkarni,S.V., Surveying and Levelling, Part I & Part II , United bookCorporation, Pune. 1998.
2. Shahani, P.B., Text book of Surveying, Vol.I & II, Oxford & IBH Publications, 1998.
3. Lillesand,T.M.,and Kiefer R.W., Remote sensing and Image Interpretation, John Wiley and Sons, Inc, New York,1997.

4. Paul.R. Wolf Elements of Photogrammetry with air photo interpretation, McGraw – Hill,International Book Company, Japan, 1993.
5. Rueger,J.M. Electronic Distance Measurement, Springer – Verlag, Berlin,1990.

SURVEYING LAB- II (BTCE407L)

1. (a) Measurement of horizontal angle.
   (b) Measurement of vertical angle.
2. (a) Measurement of horizontal angle by repetition method.
   (b) Measurement of included angle between various points by Reiteration method.
3. (a)Measurement of height and distance using trigonometric leveling (base accessible)
   (b) Measurement of base inaccessible by single plane method.
   (c) Measurement of base inaccessible by double plane method.
4. (a) Setting out a simple curve by means offsets from long chord.
   (b) Setting out a simple curve by Rankine's method.
   (c) Setting out a simple curve by two theodolite method.
5. (a)Measurement of height and distance using principles of tachometric surveying.
   (b) Measurement of distance between accessible points by stadia method.
   (c) Measurement of distance between two accessible points by tangential tachometry method.
6. Setting out of structure.
7. Determination of area using total station.
8. Traversing using total station.
9. Contouring using total station.
10. Determination of remote height using total station.
11. Setting out using total station.
12. Measurement of distance, gradient and difference of height between two inaccessible points using total station.

ENGINEERING GEOLOGY LAB (BTCE408L)

List of experiments

1. Study of physical properties of Minerals (Hornblende, Garnet, Olivine, Biotite, Kyanite).
2. Study of physical properties and Identification of minerals referred Under theory (Talc, Calcite, Asbestos, Chlorite, Muscovite)
3. Study of physical properties and Identification of minerals referred Under theory (Jasper, Flint, Feldspar, Quartz, Magnetite)
4. Study of physical properties and Identification of minerals referred Under theory (Chromite, Pyrolusite, Graphite, Hematite, Pyroxene)
5. Study of physical properties and Identification of minerals referred Under theory

(Magnesite, Pyrite, Galena, Bauxite, Halite, Corundum)

6. Megascopic and microscopic description and identification of rocks referred Under theory (Granite, Porphyritic granite, Dolerite, Basalt)
7. Megascopic and microscopic description and identification of rocks referred Under theory (Conglomerate, Ripple sandstone, Shale, Limestone)
8. Megascopic and microscopic description and identification of rocks referred Under theory(Gneisses, Marble, Slate, Quarzite)
9. To use measurements of present-day rock geometries to uncover information about the history of deformation (strain) in the rocks, and ultimately, to understand the stress field that resulted in the observed strain and geometries.
10. To draw a geological section along X-Y axis and interprete the geological map.

PHYSICAL EDUCATION

Physical Education is compulsory for all the Undergraduate students

a. The activities will include games and sports / extension lectures.
b. Two Hrs. / Week will be allocated for physical education in the third and fourth semesters. The student participation shall be for a minimum period of 45 hours inboth the semesters put together.
c. These activities will be monitored by the Director of Physical Education.
d. Pass /Fail will be determined on the basis of participation, attendance, and performance. If a candidate Fails, he/she has to repeat the course in the subsequent years
e. Pass in this course is mandatory for the award of degree.

3rd Year
5th Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE501	Engineering Hydrology	4	-	-	4	30	70	100
BTCE502	Structural Analysis-I	4	-	-	4	30	70	100
BTCE503	Geotechnical Engineering-I	4	-	-	4	30	70	100
BTCE504	Environmental Engineering-I	3	1	-	4	30	70	100
BTCE505	Transportation Engineering-I	4	-	-	4	30	70	100
BTCE506	Water ResourcesEngineering	3	1	-	3	30	70	100
	Practical							
BTCE507L	Geotechnical Engg. Lab	-	-	4	2	30	70	100
BTCE508L	Fluid Mechanics Lab	-	-	4	2	30	70	100
	Total	**22**	**2**	**08**	**27**	**240**	**560**	**800**

ENGINEERING HYDROLOGY (BTCE501)

Subject Code	BTCE501	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	04

Course Objectives:

- To build on the student's background in hydrology and hydraulics and understanding of water resources systems
- To develop the skills in measurement and estimation of rainfall runoff.
- To develop skills in the ground water flow, type of aquifer and yield from the well.
- To provide the knowledge of Statistical analysis, flood frequency steadies
- To study the effect, causes and remedial measures of water logging

Course Content

UNIT I

Introduction: Hydrological cycle and processes, Precipitation, infiltration and evapotranspiration, forms of precipitation, Measurement, analysis, depth-area-duration, and intensity-duration, frequency relations

UNIT II

Evaporation: Process, Measurement and estimation, Infiltration process, Evapotranspiration measurement and estimation, Stream flow measurements

UNIT III

Runoff and Hydrographs: Factors affecting flow hydrograph, Rainfall runoff correlations, Flow duration curve, mass curve, Unit hydrograph, its analysis and S-curve hydrograph, Synthetics and instantaneous unit hydrographs

UNIT IV

Statistical analysis, flood frequency steadies, Rational methods, time area curves, Design flood, design storm risk, reliability and safety factors

UNIT V

Channel and flood routing, time series analysis of droughts and floods. Groundwater hydrology, flow equation confined and unconfined flow, well hydraulics steady and unsteady flow, well losses, specific capacity

REFERENCES

1. Subramanya, Engineering Hydrology, Tata-McGraw Hill, 2004.
2. Ragunath. H.M., Hydrology, Willey Eastern Limited, New Delhi, 2000.

STRUCTURAL ANALYSIS- I (BTCE502)

Subject Code	**BTCE502**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Unit –I

Static indeterminacy – Analysis of statically indeterminate beams and frames by consistent deformation/force method.

Unit II

Analysis of plane trusses with one or more redundant members by force method - trusses with lack of fit - Thermal stresses - Settlement of supports – analysis of trussed beams.

Unit – III

Slope Deflection Method - Continuous beams and rigid frames (with and without sway) -Symmetry and anti symmetry – Simplification for hinged end - Support displacements.

Unit IV

Moment Distribution Method - Stiffness and carry over factors – Distribution and carry overof moments - Analysis of continuous Beams - Plane rigid frames with and without sway

Unit – V

Kani's method of analysis of beams and frames. Column-analogy method of analysis

ofsimple and symmetric beams and frames.

Text Books

1. Punmia. B. C., Jain, A. K., and Jain, A. K., Strength of Materials and Theory ofStructures, Vol. II, Eleventh Edition, Laxmi Publications, New Delhi, 2002.
2. Bhavikatti. S. S., Structural Analysis, Vol. I, Vikas Publishing House (P) Ltd.,New Delhi, Second Edition, 2002.

Reference Books

1. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition, 1989.
2. Jindal, R. L., Indeterminate Structural Analysis, S.Chand & Co. New Delhi, Third Edition, 1997.
3. Kinney. S.J., Indeterminate Structural Analysis, Oxford IBH Publishing Co., 1999.

GEOTECHNICAL ENGINEERING- I (BTCE503)

Subject Code	**BTCE503**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Unit-I

Soil formation – soil minerals – soil structure - three phase system – definitions- inter-relationships – Index properties - IS soil classification – sol deposits in India.

Unit-II

Soil hydraulics : soil water – capillary phenomenon – permeability – field and laboratorytest - seepage and flow nets – geostatic stress - neutral and effective stress.

Unit-III

Stress Analysis- Stress due to concentrated load, due to uniformly loaded area, line load strip load- pressure distribution diagrams - contact stress - Westergarrd's analysis.

Unit-IV

Compressibility: One dimension consolidation - consolidation process - consolidation theory – laboratory test – pre consolidation pressure. Compaction – laboratory tests – field compaction.

Unit-V

Shear strength- Mohr – coulomb theory – shear strength parameter – laboratory and field tests – pore pressure parameters - stress path – in-situ shear strength - factors affecting shear strength - shearing characteristics of sand and clay.

Text Books

1. Purushothama Raj. P, Soil Mechanics and Foundation Engineering, Pearson Education,2008

2. Punmia, B.C., Soil Mechanics and foundation Engineering, Standard Book House,1997.

Reference Books

1. Bowles,J.E., Physical and Geotechnical Properties of Soils, McGraw Hill, 1998
2. Venkataramiah. C., Geo Technical Engineering, NAIP, 2002.

ENVIRONMENTAL ENGINEERING – I (BTCE504)

Subject Code	BTCE504	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	03

Unit –I

Introduction: Water supply Scheme - objectives and requirements - Domestic, commercial and public requirements - Various methods of estimating populationVariations in rate of demand and its effects on design.

Unit-II

Sources of Water and intakes: Surface and groundwater sources - Computation of storage capacity of reservoirs by analytical and graphical methods - Forms of underground sources like wells, Infiltration wells and galleries, Intake structures, tube wells - Sanitary protection of wells,

Unit-III

Quality of Water: Indian and W.H.O. Standards for drinking water-Impurities in water - Physical, chemical and bacteriological tests for water - quality of water for trade purpose and swimming pools

Unit-IV

Water Treatment system: Unit process of water treatment - Principles, functions and design of flocculators, sedimentation tanks, sand filters, principles of disinfection, watersoftening, aeration, Iron and manganese removal.

Unit-V

Conveyance and distribution –Service reservoir location, determination of capacity – Leak detection - lining of pipes, various materials used for pipes, selection and class of pipes -. - Method of Layout of distribution systems, analysis of pipe networks by different methods, pipe appurtenance for distribution system – Plumbing works and layout of water supply system for buildings, Effects of corrosion and its prevention.

Text Books

1. Duggal, K.N., Elements of Environmental Engineering ,S. Chand & Company , New Delhi2008
2. Birdie G. S and Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons(1998), New Delhi

Reference Books

1. Peavy, H.S., Rowe, D.R. and Tehobanoglous, G., Environmental Engineering,McGraw Hill Book Company, 1998
2. Hussain ,S.K., Water supply and sanitary engineering , Oxford & IBH, New Delhi, 1997
3. Steel, E.W., Water supply and Sewerage , McGraw Hill, 1996
4. Fair, G.M., Gayer, I. and Okun , Water and Waste Water Engineering , John Wiley &Sons,1981

TRANSPORTATION ENGINEERING:-I (BTCE505)

Subject Code	**BTCE505**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

UNIT - I

Highway Development and Planning : Brief Introduction; necessity of highway planning suveys preparation of master plan highway planning in India. Highway alignment : Factors controlling alignment; Engineering surveys, Drawing & report.

UNIT - II

Highway Geometric Design : Highway cross section elements; Sight distance; Design of horizontal alignment; Design of vertical alignment. Highway materials Sub grade soils- CBR tests; Stone aggregates; Bitumen materials; Pav-ing mixes.

UNIT - III

Design of Highway Pavements : Design factors; Design of flexible pave-ments - IRC method, IRC recommendations; Design of Rigid pavements -Westergard's stress equation for wheel loads and temperatures stress; IRC recommendations. Highway construction and maintenance: Construction of water bound macadam roads; bituminous pavements and cement concrete pave-ments; Construction of joints in cement concrete pavements; Mainte-nance of highways- Water bound macadam roads, Bituminous pave-ments, Cement concrete pavements.

Unit – IV

Pavement construction techniques- Types of pavements- WBM Road construction. Construction of bituminous and rigid pavements. Pavement failures and their remedies. Surface and subsurface highway drainage. Pavement evaluation – structural, functional, design of overlays based on Benkelman beam studies, pavement Maintenance

UNIT - V

Highway Drainage : Importance of highway drainage; Requirements; Surface drainage; Sub-surface drainage; Road construction in water logged areas and black cotton soils. Traffic engineering : Introduction; Traffic characteristics- Road user, vehicular & travel pattern; Traffic operation- signal design; Types of inter-sections; Design of rotary intersection;

Text Books

1. Khanna S.K& Arora, M.G.Airport Planning and Design, Nemchand and Bros., 2007
2. Khanna, S.K. and Justo, C.E.G., Highway Engineering, Khanna Technical Publications,Delhi, 2007(reprint).

Reference Books

1. Gupta B. L and Amith Gupta, Highway and Bridge Engg., Standard publishers, andDistributor New Delhi 2003
2. Partha Chakroborthy and Animesh Das, Principles of Transportation Engineering,Prentice Hall of India Pvt. Ltd., New Delhi,2003.
3. Kadiyali, L. R, Lal, N. B, "Principles and practice of highway engineering", KhannaPublishers New Delhi ,006
4. Kadiyali, L. R, "Traffic Engineering and Transport Planning", Khanna Publishers NewDelhi , 2006

WATER RESOURCES ENGINEERING (BTCE506)

Subject Code	**BTCE506**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	03

.Course Objectives:

- To build on the student's background in hydrology and hydraulics and understanding of water resources systems
- To develop the skills in modeling of flood flows and flood routing
- To develop skills in the ground water flow, type of aquifer and yield from the well
- To provide the knowledge of design of reservoir, operation and sedimentation
- To study the effect, causes and remedial measures of water logging

Course Content

UNIT I

Hydrologic cycle - rainfall and its measurement - computation of mean rainfall over a catchment area using arithmetic mean, Theissen polygon and Isohyetal methods - Runoff -infiltration indices - Storm Hydrograph and unit hydrograph

UNIT II

River regions and their characteristics - classification of rivers on alluvial plains - meandering of rivers - river training

UNIT III

Reservoir planning - Investigations - zones of storage in a reservoir - single purpose and multipurpose reservoir - determination of storage capacity and yield - reservoir

sedimentation - Reservoir life - Sediment prevention - Flood estimation- Flood forecasting - Flood routing

UNIT IV

Ground water - types of aquifers - storage coefficient - coefficient of transmissibility - steady radial flow into a well located in an unconfined and confined aquifers - Tube wells and Open wells - yield from an open well.

UNIT V

Water logging - causes and effects of water logging - remedial measures - land reclamation - land drainage - benefits - classification of drains - surface drains - subsurface drains - design principles and maintenance of drainage systems.

References

1. Punmia, B.C., Irrigation and Water Power Engineering, Standard Publishers, 2001.
2. Ralph A. Wurbs, Wesley P.James, Water Resources Engineering.

GEOTECHNICAL ENGG. LAB (BTCE507L)

List of experiment

1. Atterberg's Limits.
2. Field density-core cutter and sand replacement method
3. Grain size analysis.
4. Permeability of soil, constant and variable head test.
5. Compaction test.
6. CBR Test.
7. Consolidation test.
8. Unconfined compression test.
9. Tri-axial Compression test.
10. Direct shear test.
11. Vane shear test.

Reference Books

1. Alam Singh., Soil Engineering (In Theory and Practice), Geotechnical Testing andInstrumentation (Vol .2), 1998.
2. Bowles, J.E., Engineering Properties of Soils and Measurements, McGraw Hill, 1978

Fluid Mechanics Lab (BTCE508L)

List of experiment

1. Calibration of Venturimeter.
2. Calibration of Orifice meter.
3. Performance Test on Centrifugal Pump.
4. Performance Test on Reciprocating Pump.
5. To calculate Friction Factor for a given Pipe Line.
6. Impact of jet of water on Vane.
7. Performance Test on Pelton Wheel.
8. Bernoulli's experiment.
9. Performance Test on Francis Turbine.
10. Performance Test on Kaplan Turbine.

GENERAL PROFICIENCY –I

Unit -I Art Of Communication

Verbal and Non-verbal Communication – Barriers to Communication – Importance of Body Language – Effective Listening – Feedback

Unit – II: Introduction To Soft Skills

Attitude – Self-Confidence – Leadership Qualities – Emotional Quotient – Effective Time Management Skills – Surviving Stress – Overcoming Failure – Professional Ethics – Interpersonal Skills

Unit – III Writing

Importance of Writing–Written Vs Spoken Language–Formal and Informal Styles of writing – Resources for improving writing – Grammar and Usage – Vocabulary Building – SWOT analysis

Unit – IV Speaking Practice

Dialogue – Telephone Etiquette– Public Speaking –Debate – Informal Discussions – Presentations

Unit – V Aptitude

Verbal and Numerical aptitude

References

1. Nicholls, Anne. Mastering Public Speaking. Jaico Publishing House,2003.
2. Aggarwal, R.S. Quantitative Aptitude. S.Chand &Co.,2004.
3. Leigh, Andrew and Michael Maynard. The Perfect Leader. Random House BusinessBooks,1999.
4. Whetton .A.David and Kim S. Cameron. Developing Management Skills. PearsonEducation, 2007.
5. Lakshminarayan K.R, Developing Soft Skills. Scitech, 2009.

6th Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE601	Structural Analysis-II	4	-	-	4	30	70	100
BTCE602	Geotechnical Engineering-II	4	-	-	3	30	70	100
BTCE603	Environmental Engineering-II	3	1	-	4	30	70	100
BTCE604	Reinforced Cement Concrete I	4	-	-	4	30	70	100
BTCE605	Transportation Engineering-II	3	1	-	4	30	70	100
BTCE606X	Elective-I	4	-		3	30	70	100
	Practical							
BTCE607L	Environmental Engg. Lab	-	-	4	2	30	70	100
BTCE608L	Computer Aided Design Lab	-	-	4	2	30	70	100
	Total	22	2	8	26	240	560	800

STRUCTURAL ANALYSIS- II (BTCE601)

Subject Code	BTCE601	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	04

Unit -I

ILD for shear, moment and reactions for statically determinate beams and pin jointed trusses.

Unit -II

Moving loads for statically determinate structures –single and several points loads – maximum bending moment and maximum shear force – equivalent u.d.l. - absolute maximum bending moment - determination of equivalent UDL.

Unit - III

Influence lines- Müller-Breslau Theorem - principle and its application. Influence lines for continuous beams. Muller Breslau Principles qualitative approach for single bay, singlestorey portals. Analysis of frames for lateral loads by portal and cantilever methods.

Unit-IV

Theory of arches - Analysis of three hinged, two hinged and fixed arches - influence lines, rib shortening, settlement, and temperature effects. Analysis of forces in cables - Suspension bridges.

Unit -V

Plastic Theory – Yield stress - Load Factor – Plastic Hinge – Moment redistribution - Shapefactor – Upper and lower bound theorems – plastic analysis of beams and frames.

Text Books

1. Bhavikatti. S. S., Structural Analysis, Vols. I & II, Vikas Publishing House (P) Ltd., New Delhi,Second Edition, 2002.
2. Punmia. B. C., Jain, A. K., and Jain, A. K., Strength of Materials and Theory of Structures,Vol. II, Eleventh Edition, Laxmi Publications, New Delhi, 2002.

Reference Books

1. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition,1989.
2. Jindal, R. L.Indeterminate Structural Analysis, S.Chand & Co. New Delhi, Third Edition, 1997.

GEOTECHNICAL ENGINEERING:-II (BTCE602)

Subject Code	**BTCE602**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	03

Unit-I

Soil Exploration: Introduction, need, planning, stages - depth and spacing of soil-exploration methods – samplers, sampling method – In situ tests – SPT,CPT, VST, pressure meter - exploration reports.

Unit-II

Stability of slopes: Introduction- slopes failure - stability of infinite slope – land slides. Finite slope analysis - Swedish circle method – stability number. Slope stability – improving slopestability by reinforcement and confinement.

Unit –III

Lateral earth pressure passive and earth pressure at rest, Rankine and Coulomb's: Active, theory–Rebhann's Method. Earth pressure due to inclined back fill, line load and earth quake load- Cantilever sheet pile wall in granular and clay soil. Design of braced excavations.

Unit–IV

Shallow foundation: Types and selection criteria. Bearing capacity - Terzaghi's analysis – IS code - methods to determine bearing capacity – field tests - proportioning of foundation

- BC of foundation subjected to moments and earthquake loading. Methods to increase BC – compaction – dewatering - pre loading – stone columns – lime stabilistion.

Unit-V

Pile foundations: Introduction- classification-selection criteria- Individual and group carrying capacity- static and dynamic approach-pile load tests under reamed piles- IS -Codal provisions. Methods to increase pile carrying capacity – deep compaction methods – grouting.

Text Books

1. Purushothama Raj. P, Soil Mechanics and Foundation Engineering, Pearson Education,2008
2. Punmia, B.C., Soil Mechanics and Foundation Engineering, Standarad Book House,1997

Reference Books

1. Bowles.J.E., Foundation Analysis and Design, McGraw hill 5th Edition , 1997.
2. Varghese.P.C., Foundation Engineering , Prentice Hall, Indian , 2008
3. Das.B.M, Principles of Foundation Engineering, Brooks/Cole Engineering Division, CA.

ENVIRONMENTAL ENGINEERING:- II (BTCE603)

Subject Code	**BTCE603**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Unit-I

Definitions - General considerations- Interdependence of water supply and waste water disposal - source and nature of waste water - Combined and separate system – surface drainage - storm water flow – Investigation and design of sewerage schemes – Data collection - Design flow for separate, storm and combined systems.

Unit-II

Sewage Characteristics- Physical and chemical characteristics - Biology of sewage - chemical tests - D.O. and B.O.D. and its significance. Characteristics and quantificationof raw and digested sludge.

Unit –III

Collection and Transport of sewage - Materials for sewers - their strength - Corrosion ofsewers - Flow formulae - Self cleansing of sewers - Full and partial flow conditions - Sewersections. Design of separate sewers - Storm drains and combined sewer systems.- Design principles and procedures, sewer construction: Sewer joints - Jointing materials, specification and tests - Sewer laying under various conditions, Loads on sewers – Tests forsewers.

Flushing equipment for removal of sand, grit - Repair and connections - Clearing catchbasins, Gases in sewers - Sewage pumping, types of pumps, capacity, design of centrifugal pumps - Manholes - Inlets - catch basins

- Sand, grease and oil traps. Sanitary fixtures and fittings - General layout and street

connection - Principles of design of anti syphonage device -Types - Inspection chamber - Fresh air inlet.

Unit-IV

Primary treatment : Basic principles of sewage treatment - Screens, Grit chamber - Principles of sedimentation - Design of settling tanks - Types of settling tanks - Chemical precipitation. Biological Treatment and unit Process : Contact beds - Trickling filter - Description and operation of low rate and high rate filters, intermittent sand filter - Design of the above filters. Activated sludge Process: Theory - Diffuser and Mechanical aeration - Conventional, High rate and extended aeration process - Process modification - Oxidation ditch - Principles and design of waste stabilization lagoon - aerated Lagoon. Principle of Sludge digestion - Optimum conditions - Digestion tanks -Supernatant liquid - Sludge gas -Drying beds. Septic and Imhoff tanks.

Unit-V

Wastewater Disposal and Reuse - Disposal of sewage - Reduction of BOD - Land disposal - Discharge in to rivers. lakes, estuaries and ocean – River pollution - Oxygen sag curve - recycle and reuse of waste effluents. – Disinfection –Chlorination and odour prevention. Introduction to Low cost treatment methods -Special nature of problem of industrial water - Population equivalent – Process modifications and by product recovery

Text Books

1. Duggal, K.N., Elements of Environmental Engineering, S.Chand & Company Ltd., 2008.
2. Birdie G. S and Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons(1998), New Delhi

Reference Books

1. Peavy, H.S., Rowe, D.R. and Tehobanoglous, G., Environmental Engineering, McGraw Hill Book Company, 1998
2. Hussain ,S.K., Water supply and sanitary engineering , Oxford & IBH, New Delhi,1997
3. Steel, E.W., Water supply and Sewerage , McGraw Hill, 1996
4. Fair, G.M., Gayer, I. and Okun , Water and Waste Water Engineering , John Wiley &Sons, 1981

Reinforced Cement Concrete I (BTCE604)

Subject Code	**BTCE604**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Unit-I

Role of structural engineer in structural design – elements of structures – reinforced concrete – ductility versus brittleness – methods of design – codes of practice - WorkingStress Method - Introduction-Permissible stresses-Factor of Safety- Behaviour of R.C.C beams under Flexure, Shear, Bond and Torsion- Design of beams for flexure, shear, bond and torsion.

Unit-II

Limit State Method: Concepts- Assumptions- Characteristic Strength and Load, Partial Safety Factors- Limit States- Limit State of Collapse in Flexure, Shear, Bond and Torsion- Design of beams for flexure, shear, bond and torsion.

Unit-III

Limit State Design of One-Way, Two- Way and Continuous Slabs using BIS coefficients - Design of Lintel Beams.

Unit-IV

Limit State Design of Short Columns and Long Columns subjected to combined axial load and bending using interaction diagram.

Unit-V

Design of Footings (Limit State method)- Isolated footing with axial and eccentric loading- Combined Rectangular and Trapezoidal footing, Design of Stair Cases.

Text Books

1. Punmia. B.C and Jain, A.K., Comprehensive RCC Designs, Lakshmi Publications (P) Ltd.,New Delhi, Ninth Edition, 2002
2. Ashok K. Jain, 'Reinforced Concrete Limit State Design', 4th Edition Nem Chand & Bros,Roorkee , 1993

Reference Books

1. Shah V.L and Karve SR, Advanced Reinforced Concrete Design, StructuresPublications, Pune, 2002.
2. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, Tata Mc Graw HillPublishing Company Ltd., New Delhi, 2002.
3. Nilson H., A.H., George Winter,G., 'Design of Concrete Structures', McGraw Hill BookCo., New York, 1972
4. Park R and Pauloy T, Reinforced Concrete Structures, John Wiely & Sons Inc.
5. Mallick S.K., Reinforced Concrete, Oxford & IBH Publishing Company

TRANSPORTATION ENGINEERING.- II (BTCE605)

Subject Code	**BTCE605**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

UNIT - I

RAILWAY ENGINEERING Introduction : Role of railways in transportation; Comparison of railway and highway transportation; Development of railway systems with particular reference to India; Classification of railways. Railway Track : Permanent way: Gauges in Railway track, Railway track cross - sections; Coning of wheels. Rails & Rail Joints : Functions of rails; Requirements of rails; Types of rails sections; Standard rail sections; Length of rails; Rail failures; Wear on rails.Requirements of an ideal joint; Types of rail joints; Welding of rails. Sleepers : Functions of sleepers; Requirements of sleepers; Classification of Sleepers - Timber sleepers, Metal sleepers & Concrete sleepers; Comparison of different types of sleepers. Fish Plates : Fish plates, section of fish plates, failure of fish plates. Ballast : Functions and requirements of ballast; Types of ballast; Renewal of ballast.

UNIT – II

Geometric Design Of Track : Necessity; Gradients & Gradient Compensation; Elements of horizontal alignment; Super elevation; Cant deficiency and cant excess; Negative Super elevation; Length of Transition Curve, Length of vertical curve. Points And Crossings Functions of components of turnout; Crossings. Stations And Yards Site selection for railway station; Requirements of railway station; Classifications; Station yards; Level crossing. Signalling : Objects of signaling; Classification of signals; Controllingabsolute block system. Standards of inter locking

UNIT - III

AIRPORT PLANNING AND DESIGN Introduction : Development of air transportation system with particular reference to India; Aeroplane components; Air-craft characteristics. Airport planning and layout Selection of site; Apron; Hanger; Typical airport layouts; Airport marking; Airport lighting; Drainage systems. Airport Obstruction : Zoning laws; Classification of obstructions; Imaginary surfaces; Approach zone; Turning zone.

UNIT - IV

Runway Design : Runway orientation; Basic runway length; Corrections for elevation; Temperature and gradient; Runway geometric design. Specifications for Structural Design Of Airport Pavements : Design factors methods for flexible and rigid pavements; LCN system of pavement design.

UNIT - V

DOCKS AND HARBOUR ENGINEERING Introduction : Types of water transportation; Economics and advantages of water transportation. Planning and Design Of Port Facilities : General layout and design considerations; Pier and wharf structures; Fender systems; Transit sheds and Apron; Container ports; Docks; Dredging; Light Houses**.**

Text Books

1. Kadiyali, L. R., Traffic Engineering and Transport Planning, Khanna Publishers, NewDelhi, 2006
2. Saxena, C.S.and. S. Arora. S.A., course in Railway Engineering, Dhanpat Rai & SonsNew ,Delhi. 2007.

Reference Books

1. Antia, K.F, Railway Track, The New Book Company Pvt. Ltd., Bombay, 2006
1 .Banks, J. H., Introduction to Transportation Engineering, McGraw-Hill Book Co., 2005.
3. Papacostas, C. S., and Prevedouros, P. D. Transportation Engineering and Planning,Prentice Hall, 3rd edition, 2002.

4. Agarwal, M. M., Indian Railway Track, 14th Edition, Prabha and Co., New Delhi, 2002.
5. Kristi, Lal, Transportation Engineering, PHI, New Delhi, 2008

ENVIRONMENTAL ENGG. LAB (BTCE607L)

List of experiment

1. Determination of pH of a sample of water.
2. Determination of turbidity in a water sample.
3. Determination of total, suspended, and dissolved solids.
4. To determine the alkalinity in a sample of water.
5. To determine sulfate ion concentration in a water sample using method: 4500-$so4^{2-}$
6. Determination of chloride concentration in a sample of water.
7. Determination of acidity.
8. Determination of hardness in a sample of water.
9. To determine odour and taste in a water sample.
10. To determine the na, ca, k in a sample of water introduction.
11. Determination of percentage of ammonia nitrogen present in a given sample of water.

COMPUTER AIDED DESIGN LAB (BTCE608L)

Unit-I

Introduction and Demonstration –analysis and Design Packages in Structural Engineering like STAAD-III, Pro 2007 GTSTRUDL, ETABS etc. Analysis and Design of continuous beams, Multistory Frames, Trusses– Analysis of results.

Unit-II

GIS Software Introduction and demonstration –Geographical Information systems– Geomedia Professionals- Thematic –overlays- Applications in Water resources Engineering.

Mat Lab Software

Unit-III

Introduction to Mat lab 6 software – Roots of an equation –Solution of simultaneous equations – Matrix Inversion –Linear Regression line of given points –Curve fitting using polynomial regression – Eigen value extraction and Eigen vectors.

Reference Books

1. Rajaraman,V. Computer Oriented Numerical Methods Prentice Hall of India, 2002
2. Rudra Pratap, Introduction to Mat Lab 6, Oxford Press, 2002
3. STAAD –III/ STADD RD Manual, 2002
4. ETABS and SAP 2000 Manual , 2007
5. GeoMeida Professional 6 Manual, 2001
6. Mat Lab – 6 Manual, 2001

GENERAL PROFICIENCY –II

Unit – I : Composition Analysis

Technical and Non-Technical Passages (GRE Based) – Differences in American and BritishEnglish – Analyzing Contemporary issues – Expanding Terminology

Unit – II : Writing

Job Application Letter Writing – Resume Writing

Unit – III : Oral Skills

Group Discussion – Introduction and Practice – Team Work – Negotiation Skills – Organizing and Attending Meetings – Facing Interviews

Unit – IV : Adapting To Corporate Life

Corporate Etiquette – Grooming and Dressing

Unit – V : Aptitude

Verbal and numerical aptitude

References

1. 1.Pushplata and Sanjay Kumar. Communicate or Collapse : A Handbook of Effective
2. Public Speaking, Group Discussions and Interviews. Prentice-Hall, Delhi,2007.
3. Thorpe, Edgar. Course in Mental Ability and Quantitative Aptitude. Tata McGraw-Hill,2003.
4. Thorpe, Edgar. Test Of Reasoning. Tata McGraw-Hill,2003.
5. Prasad,H.M. How to prepare for Group Discussion and Interview. Tata McGraw- Hill,2001.
6. Career Press Editors.101 Great Resumes. Jaico Publishing House,2003.
7. Aggarwal, R.S. A Modern Approach to Verbal & Non-Verbal Reasoning. S. Chand &Co.,2004.
8. Mishra Sunita and Muralikrishna, Communication Skills for Engineers, First Edition.Pearson Education, 2004.

4th Year

7th Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE701	Engineering Economics	4	-	-	4	30	70	100
BTCE702	Reinforced Cement Concrete II	4	-	-	4	30	70	100
BTCE703	ESTIMATION AND COSTING	3	1	-	4	30	70	100
BTCE704X	Elective-II	4	-	-	3	30	70	100
BTCE705	Design of Steel Structures-I	4	-	-	4	30	70	100
BTCE706X	Elective-III	4	-	-	3	30	70	100
BTCE707	Industrial Visits /Trainings	-	-		2	100	-	100
	Practical							
BTCE708L	Concrete Technology and Highway Engineering Lab	-	-	4	2	30	70	100
	Total	**24**	**1**	**4**	**26**	**310**	**490**	**800**

ENGINEERING ECONOMICS (BTCE701)

Subject Code	BTCE701	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	04

Unit-I

Introduction to Economics-Flow in an Economy, Law of Supply and Demand, Concept of Engineering Economics - Engineering Efficiency, Economic Efficiency, Scope of Engineering Economics, Elements of Costs, Marginal Cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-Even Analysis, P/V ratio, Elementary Economics Analysis-Materialselection for product, Design selection for a product, Building material selection, Process Planning,

Unit-II

Make or Buy Decision, Value Engineering-Function, Aims, Value Engineering procedure, Interest Formulas and their Applications - Time Value of Money, Single Payment Compound Amount Factor, Single Payment Present Worth Factor, Equal Payment Series Compound Amount Factor, Equal Payment, Series Sinking Fund Factor, Equal Payment Series Present Worth Factor, Equal Payment Series Capital Recovery Factor, Uniform Gradient Series Annual Equivalent Factor, Effective Interest Rate, Examples in all the methods.

Unit-III

Methods of Comparison of Alternatives- Present Worth Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Future Worth Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Annual Equivalent Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Rate of Return Method, Examples in all the methods

Unit-IV

Replacement and Maintenance Analysis- Types of Maintenance, Types of ReplacementProblem, Determination of Economic Life of an Asset, Replacement of an Asset with a New Asset - Capital Recovery with Return and Concept of Challenger and Defender, Simple Probabilistic Model for items which fail Completely.

Unit -V

Depreciation - Introduction, Straight Line Method of Depreciation, Declining Balance, Method of Depreciation, Sum-of-the-Years-Digits Method of Depreciation, Sinking Fund Method of Depreciation/Annuity Method of Depreciation, Service Output Method of Depreciation, Evaluation of Public Alternatives-Introduction, Examples, Inflation Adjusted Decisions- Procedure to Adjust Inflation, Examples on comparison of alternatives and Determination of Economics Life of asset.

Text Book

1. Pannerselvam, R., Engineering Economics, Prentice-Hall of India Pvt. Ltd., New Delhi 2001.

Reference Books

1. Degarmo, E.P., Sullivan, W.G. and Canada, J.R.. Engineering Economy, Macmillan,New York, 1984.
2. Grant, E.L., Ireson,.W.G. and Leavenworth, R.S., Principles of Engineering Economy, Ronald Press, New York, 1976.
3. Smith G.W. En :'Engineering Economics, Iowa State Press, Iowa, 1973

Reinforced Cement Concrete II (BTCE702)

Subject Code	**BTCE702**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

UNIT - I

Continuous Beam (Limit State Method) : Design of continuous beam One way Slabs (Limit State Method) Design of Simply supported, Cantilever and Continuous slabs

UNIT-II

Two Way Slabs (Limit State Method) Design and detailing of two way slabs Flat Slabs (Limit State Method) Design and detailing of flat slabs by direct design method.

UNIT-III

COLUMNS (LIMIT STATE METHOD) : Assumptions; Design of axially loaded columns ; Design of rectangular columns (short and Long) sub-jected to axial load and bending moment using Interaction diagrams (SP-16 Charts)

UNIT-IV

Retaining Walls (Limit State Method): Types of retaining walls, Forces on retaining walls; Stability requirements; Design and detailing of cantile-ver type retaining wall. Foundations (Limit State Method) : Design and detailing of rectangu-lar Isolated footing and Combined footing

UNIT V

Design of Staircase: Introduction to stair cases, design and detailing of dog-legged stair, Single flight stairs. **Lintel** : Design and Detailing of a Lintel

Pre-Stressed Concrete : Concept of prestressing, Difference between RCC & PSC, Situations where prestressed concrete is used, and Materials used in prestressed concrete and their specifications as per IS. Pre-tensioning and Post-tensioning, Mention the systems of prestresses, Mention the Losses in Prestresses. (Excluding numerical problems)

Text Books

1. Subramanian.P, Design of steel structures, Oxford Publishers, New Delhi, 2007.
2. Dayaratnam.P, 'Design of Steel Structures', Wheeler & Co Ltd., Allahabad, 1996
3. Raghupathy. M, 'Design of Steel Structures', Tata McGraw Hill Publishing CompanyLtd., New Delhi, 1995.
4. Ramachandra, 'Design of Steel Structures', Vol. I & II, Standard book house, Delhi

Reference Books

1. Punmia B.C, Ahok Kumar Jain and Arun Kumar Jain, Comprehensive Design of Steel Structures, Lakshmi publications (P) Ltd., New Delhi, 1998.
2 Arya, A.S. and Ajmani, J.L., 'Design of Steel Structures', Nem Chand and Bros, Roorkee, 2000
3. Solmon and Johnson, 'Steel Structures- Design and Behaviour', Intext Educational Publishers, 1971

ESTIMATION AND COSTING (BTCE703)

Subject Code	**BTCE703**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

UNIT I

ESTIMATE OF BUILDINGS

Introduction to estimation- Necessity of Estimation- Units and Measurements-Types of Estimates- Methods of Estimation-Load bearing and framed structures Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.- Estimation of Steel for RCC works.

UNIT II

ESTIMATE OF OTHER STRUCTURES

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tube well – open well Estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, syphon, fall.

UNIT III

SPECIFICATION AND TENDERS

Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications for buildings, Roads Tenders – Contracts – Types of contracts, BOT – Arbitration and legal requirements.

UNIT IV

VALUATION

Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Calculation of Standard rent – Mortgage – Lease-Valuation of Building- Loss assessment

UNIT V

REPORT PREPARATION Principles for report preparation – report on estimate of Official building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

TEXT BOOKS

Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003

Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand & Company Ltd., 2004

Design of Steel Structures – I (BTCE705)

Subject Code	**BTCE705**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

UNIT - I

Introduction : What are steel structures ? ; What a steel structure consists of ?; Structural steel; Products of structural steel; Standards, Codes and Specifications; Fatigue; Brittle fracture; Corrosion protection of steel structures; Design philosophies; Methods of structural analysis ; Plate(Local) buckling; Classification of sections. Structural steel fasteners : Introduction; Welding - Shield metal arcwelding, Automatic submerged arc- welding, Types of welds, Quality of welds, Weld symbols and notation, Specifications for welding ; Bolting-Types of failure, Design specifications, High- strength bolts

Tension members : Introduction ; Net area ; Shear-lag ; Design of tension members

UNIT - II

Compression members : Introduction; Euler's buckling theory; Behaviour of real columns; Types of sections; Design of columns; Validity of design strength calculations; Design of compression members ; Design Procedure; Built-up compression members.

UNIT - III

Beams : Introduction ; Flexural behaviour of beams which does not undergo lateral buckling; Flexural behaviour of beams which undergo lateral buckling ; Shear behaviour ; Web buckling and Crippling ; Design strength in bending ; Design strength in shear ; Limit state serviceability - Deflection

UNIT - IV

Beam-columns : Introduction; Analysis of beam-columns; Modes of failure; Design specifications Column Splices and Bases : Introduction ; Column splices ; Column bases

Unit-V

Design of Beams- Laterally Supported and Unsupported –Web Crippling- Built Up Beams- Design of Gantry Girder, Design of Beam Column Joints.

Reference Books

1. Jain, A.K., Reinforced Concrete Limit State Design, Nem Chand Brothers, 1990.
2. Sinha. S.N. Reinforced Concrete Design, Tata McGraw Hill, 1988.
3. Varghese, P.C .Limit State Design of Concrete, Oxford IBH, 1983.

INDUSTRIAL VISITS /TRAINING (BTCE707)

Subject Code	BTCE707	IA Marks	30
Number of Lecture Hours/Week	-	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	02

During the course of study from 3rd to 7th semester each student is expected to undertake a minimum of four industrial visits or undertake a minimum of two weeks ofindustry/field training. The students are expected to submit a report, which shall be evaluated by an internal assessment committee at the end of seventh semester for 100 marks.

CONCRETE TECHNOLOGY AND HIGHWAY ENGINEERING LAB (BTCE708L)

List of experiment

1. To determine aggregate crushing value test.
2. To determine aggregate impact value test.
3. To perform Los Angeles Abrasion test on aggregate.
4. To identify the different shapes of aggregate using flakiness test.
5. To perform penetration test of bitumen
6. To determine softening point of bituminous material.
7. To determine the fineness of a given sample of cement by sieving.
8. To determine specific gravity and unit weight of a given sample of cement
9. To determine standard consistency, initial setting time and final setting time of given sample of cement.
10. To determine compressive strength of given sample of cement.
11. To determine silt content in fine aggregate by sedimentation method.
12. To observe bulking of fine aggregate in a field test and thereby determine the necessary adjustment for the bulking of fine aggregate.

8th Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE801	Construction Management	4	-	-	4	30	70	100
BTCE802	Disaster Mitigation & Management	4	-	-	4	30	70	100
BTCE803	Design of Steel Structures-II	4	-	-	4	30	70	100
BTCE804X	Elective-IV	4	-	-	4	30	70	100
BTCE805	Seminar	1	-	-	2	100	-	100
BTCE806	Comprehensive Viva Voce	-	-	3	2	-	100	100
BTCE807	Project Work	-	-	12	6	50	50	100
	Total	**17**	**-**	**15**	**26**	**270**	**430**	**700**

CONSTRUCTION MANAGEMENT (BTCE801)

Subject Code	**BTCE801**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Unit –I

Management process- Roles – management theories – Social responsibilities – planning and strategic management – strategy implementation – Decision making: tools and techniques - Organizational structure – Human resource management- motivation performance- leadership.

Unit-II

Classification of Construction projects, Construction stages, Resources- Functions of Construction Management and its Applications –Preliminary Planning- Collection of Data- Contract Planning - Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.

Unit-III

Resource planning - planning for manpower, materials, costs, equipment. Labour, - Scheduling –Forms of scheduling - Resource allocation – budget and budgetary controlmethods

Unit-IV

Contract - types of contract, contract document, specification, important conditions ofcontract - tender and tender document - Deposits by the contractor - Arbitration – negotiation - M.Book - Muster roll - stores.

Unit-V

Management Information System - Labour Regulations: Social Security - welfare

Legislation - Laws relating to Wages, Bonus and Industrial disputes, Labour Administration - Insurance and Safety Regulations - Workmen's Compensation Act -other labour Laws - Safety in construction : legal and financial aspects of accidents in construction – occupational and safety hazard assessment. Human factors in safety – legal and financial aspects of accidents in construction – occupational and safety hazard assessment

Text Books

1. Ghalot, P.S., Dhir,D.M., Construction Planning and Management, Wiley EasternLimited,1992.
2. Chitkara,K.K., Construction Project Management, Tata McGraw Hill Publishing Co, Ltd., New Delhi,998.
3. Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, New Delhi,1987.

DISASTER MITIGATION AND MANAGEMENT (BTCE802)

Subject Code	**BTCE802**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

Unit-I

Introduction to Disaster Management- Natural and Man-made Disasters- International Year of Disaster Reduction

Unit-II

National Disasters- Hydro-meteorological based disasters- Tropical Cyclones, Floods, droughts and Desertification Zones- Forest Fires-Geological based disasters- Earthquake, Tsunamis, Landslides, and Avalanches.

Unit-III

Man made Disasters- Chemical Industrial hazards, major power break downs, traffic accidents, Fire hazards etc.

Unit –IV

Use of remote sensing and GIS in disaster mitigation and management.

Unit- V

Risk and Vulnerability to disaster mitigation and management options- Warning andForecasting.

Text Books

1. Thomas D. Schneid., Disaster Management and Preparedness, CRC Publication, USA,2001

2. Patrick Leon Abbott, Natural Disasters, Amazon Publications, 2002
3. Ben Wisner., At Risk: Natural Hazards, People vulnerability and Disaster, AmazonPublications, 2001
4. Oosterom, Petervan, Zlatanova, Siyka, Fendel, Elfriede M., "Geo-information forDisaster Management", Springer Publications, 2005

Reference Books

1. Selected Resources Published by the National Disaster Management Institute of Home Affairs, Govt. of India, New Delhi.

Design of Steel Structures – II (BTCE803)

Subject Code	**BTCE803**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	04

UNIT - I

Introduction; Loads on gantry girder; Web buckling and Crippling; Deflection, Check ; Design of gantry girder

Welded Plate girder Introduction ; Behaviour of transversely stiffened plate girder panels in shear ; Design methods for transversely stiffened web panels ; Design of end panels ; Other design specifications ; Design of stiffeners ; Design of welded plate girder

UNIT - II

Welded connections Introduction; Bracket connections; Simple beam end connections; Moment resistant beam end connection.

Bolted connections Introduction; Bracket connections; Simple beam end connections; Moment resistant beam end connection; Splicing of beams /girders

UNIT - III

Light-gauge steel sections Introduction; Types of sections; Design of light gauge sections; Design of axially loaded columns; Design of beams which do not buckle laterally. Composite Construction Introduction;

Composite beam ; Method of construction ; Limit states of collapse; Limit states of serviceability – Deflection

UNIT - IV

Roof Trusses Components of a trussed roof; Types of trusses; Dead, Live and wind loads on trussed roof; Design of purlins ; Design of members of a roof truss ; Design of

connections ; Design of end bearings purlins.

UNIT V

Plastic Design: Introduction to plastic method of analysis, Design of continuous beams and portal frame using plastic design approach.

Reference Books

1. Subramanian.P , Design of steel structures , Oxford Publishers , New Delhi, 2007
2. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain, Comprehensive design of steelstructures, 2000
3. Arya, A.S. And Ajmani, A.L., Design of Steel Structures, Nemchand and Brothers,Roorkee, 1986.
5. Ramchandra, Design of Steel Structures, Vol I and Vol II, Standard Book House, New Delhi, 1991.

SEMINAR (BTCE805)

Subject Code	**BTCE805**	**IA Marks**	30
Number of Lecture Hours/Week	04	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	02

Each one of the students will be assigned a Seminar Topic in the current and frontier areas. The student has to conduct a detailed study/survey on the assigned topic and prepare a report. The student will make an oral presentation followed by a brief question and answer session. The Seminar (presentation and report) will be evaluated by an internal assessment committee for a total of 100 marks.

COMPREHENSIVE VIVA-VOCE (BTCE806)

Subject Code	**BTCE806**	**IA Marks**	30
Number of Lecture Hours/Week	01	**Term End Exam Marks**	70
Total Number of Lecture Hours	60	**CREDITS**	02

The student will be tested for his understanding of basic principles of the core Civil Engineering subjects. The internal assessment for a total of 50 marks will be made by an internal assessment committee. The committee will conduct two written examinations of objective or short questions type from the all the core subjects. The external university

examination, which carries a total of 50 marks, will be a Viva Voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

PROFESSIONAL ETHICAL PRACTICE

The course should cover the following topics by way of Seminars, Expert Lectures and Assignments:

Engineering Ethics – Moral issues, Ethical theories and their uses

Engineering as Experimentation – Code of Ethics

Engineer's responsibility for safety

Responsibilities and rights

Global issues of engineering

ethics,Constitution of India

Reference Book

1. Charles D.Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999

PROJECT WORK (BTCE807)

Project work phase II will be an extension of the project work started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal assessment committee for 50 marks. The external university examination, which carries a total of 50 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

List of Electives to be Offered in 6th Sem

ELECTIVE I (BTCE606X)

PRE-STRESSED CONCRETE STRUCTURES (BTCE6061)

Unit – I

Introduction-Principles of pre-stressing-Materials-Losses-Systems of pre-stressing-Simple cable profiles-Load balancing method.

Unit – II

Pre-tensioned and Post-tensioned beams-Principles of designs-Design for flexure, bond and shear – IS Code provisions-Ultimate Strength of pre-stressed concrete beams in flexure and shear- Design of end anchorage Zones using I S Code method.

Unit – III

Deflection of pre-stressed concrete members – Methods of pre-stressing-principles of partial pre-stressing –non-pre-stressed reinforcements-Analysis and Design of composite beams.

Unit-IV

Design of Tension and Compression members-Circular pre-stressing-Pipes- Water Tanks- Analysis and design –IS-Code provisions

Unit- V

Analysis of continuous beams –Primary moment-secondary moment-cable layout-Linear Transformation – Concordant cable.

Text Books

1. Krishna Raju, N., Prestressed Concrete Structures, Tata McGraw Hill, 1997.
2. Dayaratnam. P. Prestressed Concrete Structures, Oxford & I B H,1991.

Reference Books

1. Pandit. G.S, Gupta. S.P, Prestressed Concrete, CBS Publishers and Distributors, NewDelhi, 1993.
2. Lin. T.Y. Design of Pre-stressed Concrete Structures, Asia Publishing House, Madras,1987.

COASTAL ENGINEERING (BTCE6062)

Unit –I

Coastal zone: Definition and sub division – Factors influencing coastal topography - Waves: Definitions - Classification – Liner wave theory – Assumptions and derivations of relationships – Pressure within progressive wave – Wave energy – Problems

Unit – II

Wave Transformation: Wave generation – Shoaling – Refraction – Reflection – Diffraction – Breaking of waves – Near shore currents – Tides - Tsunamis - Wave Hindcasting – forecasting - Sea level changes.

Unit – III

Wave forces on Structures: Force due to non breaking, breaking and broken waves on vertical, sloping, curved, stepped barriers and on piles – Problems.

Unit – IV

Sediment Movement : Types – Littoral Drift – Erosion process – Near shore, long shore currents and effects - Beach profile changes – case studies – Beach process - Environmental parameters- Coastal erosion in India - Dredging – Dredgers - Environmental effects of dredging - Remote sensing and GIS application in coastal engineering

Unit – V

Coastal Protection: Methods – Function – Types - Design concepts – Sea walls – Bulkhead

– Revetment – Groins – Artificial beach nourishment – Scour – Maintenance of coastalstructures.

Text Book

1. Narasimhan & S. kathiroli, Harbour and Coastal Engineering (Indian Scenario) Vol - I & Vol – II, NIOT- Chennai
2. Shore Protection Manual (Vol – I, II, III) U.S. Army Crops of Engg. USA.

Reference Books

1. Ippen, A.T., Estuarine and coastline Hydrodynamics, McGraw Hill Book Co., New York
2. Wiegel. R.L. Oceanographical Engineering., Prentice Hall, Eagle Wood Cliffs, New Jercy
3. Dean .R.G. and Darymple, R.A. Water Mechanics for Engineers and scientists.

INDUSTRIAL WASTE DISPOSAL AND TREATMENT (BTCE6063)

Unit-I

Uses of water by Industry - Sources and types of wastewaters, quality criteria, effluent standards- Individual and common effluent treatment plants - Population equivalent, Effects of industrial wastes on streams, land, air and waste water treatment plants

Unit II

Pretreatment Methods: Process modification – methods and materials changes – Reduce, reuse and recycle methods, house keeping etc. to reduce waste discharge and strength of the waste and established methods for by products recovery within the plant operations

Unit-III

Equalization – Neutralization - Oil separation – Floatation – Precipitation – Adsorption - Aerobic and anaerobic biological treatment - High rate reactors. Chemical oxidation –Ozonation –Ion Exchange – Membrane technologies

Unit-IV

Residuals of Industrial waste treatment —Characteristics of sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge.

Unit –V

Industry and power plants - manufacturing process description - wastewater characteristics and waste treatment flow sheet for typical industries – Textiles – Tanneries – Pulp and Paper –Metal finishing – Petroleum refining – Chemical industries -Sugar and distilleries –Dairy –Iron and Steel- Fertilizers –Nuclear power plants.

Text Books

1. Eckenfelder. W.W., Industrial Water Pollution Control, McGraw Hill, 2000.
2. Arceivala.S.J. Wastewater Treatment for Pollution Control, Tata Mc.Graw Hill. 2008.

Reference Books

1. Nemerow,N.L., Theories and Practices of Industrial Wastes Treatment, Addisson and Wesley, 1963.

2. Gurnham,C.F., Principles of Industrial Waste Treatment, John Wiley, New York,1948.

IRRIGATION AND DRAINAGE ENGINEERING (BTCE6064)

Unit-I

Introduction: Need, advantages and disadvantages of Irrigation - Environmental effects - Types of Irrigation systems - Gravity irrigation, canals, Tanks, Wells and Irrigation galleries - Water lifts.

Soil -water - plant relationship: Soil and its function - Physical properties of soil and their importance in relation to irrigation - Classes and availability of soil water - Movement ofwater in soils - Measurement of soil moisture - Crop growth and moisture relationship - Saltproblems in soil and effect of salts on plant growth.

Unit - II

Irrigation Requirement: Evaporation, Evapo transpiration, Consumptive use and its estimation - Crop factor - Lysimeters - Effective rain fall and irrigation requirements - Waterrequirements of various crops - Duty of water - Quality of irrigation water.

Unit –III

Methods of Irrigation: Surface, subsurface and overhead methods - Check basin, border & furrow, Drip and sprinkler irrigation - Irrigation efficiency, Depth, Rate and frequency of irrigation - Irrigation schedule.

Unit – IV

Design of channels: Design of unlined and lined channels for irrigation - Location and design of canal regulation structures - Cross drainage structures - Measuring devices.

Unit – V

Land Development: Reclamation and management of saline & alkaline soils, water logging, Causes and remedial measures - Design, construction and maintenance of drainage systems.

Irrigation Management: Management of irrigation system - water charge assessment and water use management.

Text Books

1. Punmia, B.C., and Lal ,B.B., Irrigation and Water Power Engineering, Standard Publishers & Distributors, New Delhi, 2006.
2. Sharma.R.K., and Sharma. T.K., Irrigation Engineering , S.Chand & Company Ltd, New Delhi, 2007.

Reference Books

1. Hansen, V.E., et.al., Irrigation Principles and Practices, John Wiley & Sons, 2001.
2. Sharma, R.K., Text Book of Irrigation Engineering and Hydraulic Structures, Oxford & IBH Publishing Co., 2007.
3. Michael, A.M., Irrigation Theory and Practice, Vikas Publishing House, New Delhi, 1996.
4. Das, M.M, Saikia, M.S Irrigation and water power Engineering, PHI, Learning, (P) Ltd, New Delhi, 2009.

ARCHITECTURE AND TOWN PLANNING (BTCE6065)

Unit-I

Introduction to Architecture: Origin and definition – Influence of nature – Climate – Topography – material – Social condition – Economic condition on architecture. Architectural science - factors influencing architecture, aesthetic responses: Colour andaesthetic responses- formal and informal organization of solids and voids.

Unit-II

Basic Principles: Concepts of beauty, unity, balance, composition, rhythm, harmony, style, character, integration, scale, proposition, contrast, shape and structure.

Unit-III

Urbanization: Urbanization trends in India- Classification of towns - humans settlements development policy - National approach. Urban growth: planning of towns in ancient India - Greek and Roman towns - Garden city concept - New towns & satellite towns – Urban Renewal- Planning standards for neighborhood

Unit-IV

Evolution of planning legislation in India – Organisation and administration of planning agencies at national, state, regional level and metropolitan level – building bye law – Function of local Authority – Provision of Building regulations.

Unit-V

Planning of Land uses: Residential area planning - Site & service programmes - Commercial areas - Industrial sites - rectangular areas, Principles of planning for traffic and transportation facilities - transport terminals pedestrian path and bikeways.

Text Books

1. Gallion,D., et.al, The Urban pattern city planning & design, Affiliated East West PressPvt. Ltd., New Delhi.
2. Lewis Keeble, Town Planning Made Plain & Town & Country Planning Association,London, 1983.

Reference Books

1. Rangwala, K.S., Town Planning, Charotar Publishing House, Anand, India.
2. Hiraqskar, G.K., Fundamentals of Town Planning, Dhanpat Rai & Sons., Delhi 2001.
3. Pickering,E., Architectural Design, John Wiley and Sons , London.

MASS TRANSPORTATION SYSTEMS (BTCE6066)

Unit-I

Role of Transportation: History of transit, Recent Trends in transit, Mass transportation characteristics, Demand Characteristics: Spatial, temporal and behavioral characteristics.

Mass Transportation Planning: Transportation demand surveys, Mass transportation

demand estimation, Demand projection, Trip generation, Trip distribution, Model split and route assignment.

Unit-II

Transport system Performance: Performance evaluation and analysis, Structure of decision making, Evaluation and selection methods, selection procedure Generation ofalternative schemes, Economic evaluation methods.

Terminals: Functions of terminals, Design, Typical Terminal characteristics.

Unit-III

Scheduling and Routes: Service analysis, Vehicle dispatch policy, Vehicle Requirements, Spacing of bus stops, Route spacing and performance.

Unit-IV

Management: Operational and management issues in transport planning, Reserved bus lanes and signals, Vehicle monitoring and control system, Nodal coordination.

Unit-V

Special Systems: People mover systems, Underground transportation, para transit, Rail transit system, case studies.

Text Books

1. Kristhi, Lal, Transporation Engineering, PHI, Delhi, 2008 Hay, W.W., An Introduction to Transportation Engineering, 2nd Ed., John Wiley & Sons, 2001
2. Kadiyali, L. R, "Traffic Engineering and Transport Planning", Khanna Publishers NewDelhi – 110006, 2006

Reference Books

1. Hutchinson, Urban Transport Planning, John Wiley, 2006
2. Dickey, J.W., et. al., Metropolitan Transportation Planning, TMH edition, 2002.
3. Paguette, R.J., et.al, Transportation Engineering - Planning and design, 2nd edn., John Wiley & Sons, 2002.
4. Railis, V.R, Inter city Transport, Engineering and Planning, The Macmillan Press, 2003.

CONSTRUCTION METHODS AND EQUIPMENT (BTCE6067)

Unit - 1

Modern Construction Methods - Open excavation, shafts and tunnels, pier and caisson foundation . Basement construction - construction Methods – supporting the excavations- control of ground water- shoring and underpinning- basement waterproofing.

Unit –II

Construction Methods for Bridges, roads railways, dams, harbours, river works and pipelines

Unit –III

Construction equipment and techniques for Earth moving, excavating , drilling, blasting, tunneling and hoisting and erection

Unit –IV

Equipment for: Dredging, tunneling, dewatering- Equipment for Flooring – dewateringand floors finishing

Unit –V

Equipment for production of aggregate and concrete – Crushers- feeders- screening equipment – batching and mixing equipment – hauling, pouring and pumping equipment – transporters

Reference Books

1. Antil J.M., Civil Engineering Construction, McGraw Hill Book Co., 1982
2. Peurifoy, R.L., Ledbette. W.B Construction Planning , Equipment and Methods McGrawHill Co, 2000
3. Ratay., R.T Hand Book of Temporary Structures in Construction, McGraw Hill,1984
4. Koerner., R.M, Construction & Geotechnical Methods in Foundations Engineering,McGraw Hill, 1984
5. Varma., M., Construction Equipment and its Planning & Application, MetropolitainBook Co., 1979
6. Smith, R.C, Andres, C.K Principles and Prentice of Heavy Construction, Prentice Hall,198

List of electives to be offered in 7th Semester

ELECTIVE II (BTCE704X)

EXPERIMENTAL MEASUREMENTS AND ANALYSIS (BTCE7041)

Unit -I

Displacement and Load measurement devices - Strain gauges, principle, types, performance and uses – principle and applications - Hydraulic jacks and pressure gauges – Electronic load cells – Proving Rings – Calibration of testing Machines.

Unit - II

Vibration measurement -Characteristics of structural vibrations – Linear variable differential transformer (LVDT) – Transducers for velocity and acceleration measurements
– Vibration meter – Seismographs – Vibration analyzer – Electro Dynamic Exciters - Display and recording of signals – Digital data Acquisition systems – principles and applications.

Unit -III

Wind Flow Measurements -Principles of pressure and flow measurements – pressure transducer – Wind tunnel and its use in structural analysis – structural modeling.

Unit -IV

Distress Measurement - Diagnosis of distress in structures – crack observation and measurement – Corrosion of reinforcement in concrete – Half cell construction and potential measurement – resistivity meter - Damage assessment.

Unit - V

Load testing of structures, Buildings, bridges and towers – Rebound Hammer – Ultrasonic Testing, Principles and applications - Moire fringes – brittle coatings – holography – use ofLasers for structural testing –smart materials.

Reference Books

1. Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 1996.
2. Dalley.J.W. and Riley.W.F., "Experimental Stress Analysis", Tata McGraw Hill companyLtd. New York, 1991
3. Srinath.L.S.et al, "Experimental Stress Analysis", Tata McGraw Hill company Ltd., NewDelhi, 1984
4. Sirohi.R.S., Radha Krishna.H.C., "Mechanical Measurements", New Age International (P) Limited, 1997
5. Garas.F.K., Clarke.J.L.and Armer.G.S.T., "Structural Assessment", Butterworths, London,1987.

GEOTECHNICAL PROCESSES AND APPLICATION (BTCE7042)

Unit-I

Introduction: Need – methods – suitability – Mechanical modification : principle - Surface compaction: Field compaction and equipments, compaction specification and controls. Vibration methods: dynamic consolidation, vibratory rollers, Vibro floatation.

Unit-II

Drainage methods: Well point systems, deep well drainage, vacuum dewatering system, design of dewatering system – field permeability tests, dewatering by electro osmosis.Preloading, sand drains, wick drains- Thermal methods case studies.

Unit-III

Grouting: Classification – Methods – Types – grouts – equipments, grouting design andlayout, grout monitoring – applications – Case studies.

Unit-IV

Stabilization: cement stabilization, Lime stabilisation – chemical stabilistion - methods, principles, applications and field control. Stabilization using reinforcement – rock anchor- soil tie backs.

Unit-V

Geo synthetics: Geotextiles, Geogrids, Geomembranes, Geonets, Geomats, Geomeshes, principles Design and applications – Case studies.

Text Books

1. Koerner, R.M., Construction & Geotechnical methods in foundation engineering, MGH,New York,1985
2. Hausmann. M.R. Engineering principles of Ground Modification, mcGraw-Hil
3. Purushothama raj. P. Ground improvement techniques, Laxmi Publications (P) Ltd, India

Reference Books

1. Bowle's.J.E., Foundation Analysis and design,4th edition,MGL,1998.
2. Jones.C.J.F.P., Earth reinforcement and soil structures, Butter worth &co., London,1985
3. Arora.K.R., Soil mechanics and foundation Engineering,SPD,2001

GEOGRAPHICAL INFORMATION SYSTEM (BTCE7043)

Unit -I

Data entry, storage and maintenance Types of data – spatial and non-spatial information, Geographical concepts and terminology, Advantages of GIS. Basic Concepts of GIS, organisation of data in GIS.

Unit -II

Field data, Statistical data, Maps, Aerial photographs, Satellite data, points, lines and areas features, Vector and Raster data, Advantages and Disadvantages, Data entry through keyboard, digitizers and scanners, digital data. Preprocessing of data – Rectification and registration, Interpolation techniques.

Unit -III

Data analysis and modelling
Spatial analysis – data retrieval – query – Simple analysis –Record – overlay – vector data analysis –raster data analysis – modelling in GIS – digital elevation model – DIM- cost and path analysis –artificial intelligence- expert systems

Unit -IV

Data output and error analysis Types of output data – display on screen – printer – plotter –other output devices – sources of errors – types of errors –elimination- accuracies
Unit V GIS Application
Application areas- resource management – agriculture- soil – water resources management – cadastral records and LIS integrated remote sensing application with GIS- knowledge based techniques - multi- criteria evaluation in GIS – introduction to object oriented data base models

Text Books

1. Geo Informational systems –Applications of GIS and related spatial information technologies, ASTER publications co., Chestern (England) , 1992
2. Burrough , p. a., Principles of GIS for land resources assessment, Oxford publications , 1990
3. Jeffrey Star and John Estes , Geographical information systems – An Introduction, Prentice – Hall inc. ,1990

HYDRAULIC STRUCTURES (BTCE7044)

Unit-I

Planning and Selection of Dams:
Planning , environmental considerations , storage requirements, sedimentation in reservoir, wave height and free board, selection of type of dam. Geological investigation, classification of insitu, rocks for Engineering purposes, foundation treatment,river diversion works.

Unit-II

Gravity dams: Definition, forces acting on the dam, non-overflow and overflow sections , causes of failure , design principles , elementary profile of a dam, high and low dam, stability analysis, temperature control in dams, construction and contraction joints, Galleries in dams.

Unit -III

Arch Dam: Classification and type , factors affecting layout , simple design criteria – thin cylinder theory trial load analysis, elastic theory, cantilever and Arch analysis. Earth & Rock fill Dams: Types, profile and design principles of earth dams, height and top width, side slopes and its protection, core and casing , cutoff and seepage control , drainagesystem, construction methods and quality control.

Unit-IV

Spillways ,sluices and crest gates: Definition and types of spillways , design storm andspillways capacity, energy dissipation, design criteria – design of crest gates and highhead gates ,supply and power sluices.

Unit - V

Instrumentation- Embedded instruments in dam section , foundation measurements of dam body , analysis of strain data , automatic control of dam safety.

Text Books

1. Sharma, H.D., Concrete Dams,Metroploitan,2002,
2. Punmia,B.C. and Pande.B.B. Lal, Irrigation and Water power Engineering, Standard Publishers, Ninth edition, 1986.

Reference Books

1. Garg. S.K., Irrigation and Hydraulic structures, Khanna Publishers, 1992.
2. Creager, Justin and Hinds Engineering for dams. Vol I.II.III
3. Das, M.M, Saikia, M.D Irrigation and Water Power Engineering, PHI, Learning (P) Ltd, 2009,

FINITE ELEMENT ANALYSIS (BTCE7045)

Unit -I

Need for Numerical Technique – Solutions to Differential Equations –Finite Difference Methods – Limitations Variation and Weighted Residual and Potential energy formulations
- Finite Element Method – Basic steps.

Unit - II

Shape functions – convergence Criteria –Geometric Invariance – Pascal's Triangle – Shape Functions for one Dimensional Structures - Formulation of Element Matrix - Formation of Element Nodal load Vector -Coordinate systems –Global , Local & Natural.

Unit -III

Two dimensional elements – Plane stress – Plane strain – 3,6 Nodded Triangular elements –Rectangular elements – Lagrange and serendipity elements –Isoparmetric elements - shape functions, Element stiffness Matrix – Load vector formulations –Gauss Quadraterule.

Unit - IV

Basic concepts beam elements –Axisymmetric elements Tetrahedral, hexahedral elements –Formation of shape functions-mesh generation techniques- reduction of band width – static condensation.

Unit - V

Solution Techniques- Gauss elimination –Matrix Decomposition – Based a and Frontalsolvers. Requirements of Pre and post processor in GUI based FE packages.

Text Books

1. Krishnamoorthy, C.S, Finite Element Analysis – Theory and Programming – TMH, NewDelhi, 1999
2. Zienkiewiez, O.C, Morgan,K, Finite elements & approximations , John & Sons, 1998.

Reference Books

1. Desai, C.S, Able, R.R. Introduction to the Finite Element Method, Affiliated East West Press, 1972
2. Cook, R.D, Concepts and applications of Finite element Analysis, John Wiley and Sons,1981

ADVANCED STRUCTURAL DESIGN – RCC (BTCE7046)

Unit -I

Building Frames- Approximate methods – substitute frame analysis- Design of beam column joints - Design of reinforced concrete braced and un-braced walls . Design of flat slabs.

Unit -II

Yield line theory- Equilibrium and Virtual Work method- Analysis and Design of Square,Rectangular and Circular Slabs with different boundary conditions subjected to UDL and Concentrated loads, Hillerborg's method of design of slabs. Analysis and Design of Gridfloors by approximate analysis.

Unit - III

Design of Deep Beams, Design of beams curved in plan.-Design of Silos and Bunkers,

Unit - IV

Redistribution of moments in RC beams- introduction-conditions- advantages- momentcurvature relation- ACI guidelines , Design for serviceability Limit states – Design calculations of deflectiosn and crack width as per IS456-2000.

Unit - V

Requirements for good formwork- Materials for forms- Loads on formwork - - Design of formwork –Introduction to Composite Construction – behavior and design principles. Steel
- Concrete Composite Beams, Beams with in – situ slab and pre cast rib

Text Books

1. Purushothaman ,P, Reinforced concrete structural elements : Behavior, analysis anddesign, Tata Mc Graw , 1986.
2. Varghese P.C, Advanced Reinforced Concrete Design –- Prentice- Hall of India Private Limited , New Delhi, 2002
3. Unnikrishna pillai and Devdas Menon, ' Reinforced Concrete Design', Tata Mc GrawHill Publishing Company Ltd., New Delhi, 2002

References

1. Shah VL and Karve SR , Advanced Reinforced concrete Design", Structures Publications Pune , 2002.
2. Sinha S N , Reinforced Concrete Design , Tata Mc Graw Hill Publishing Company Ltd.,New Delhi, 1996
3. Johnson R.P. , Composite Structures Vol.-I
4. Punmia B.C., R.C Structures Vol.II, Lakshmi Publication, New Delhi.

FAILURE ANALYSIS AND REHABILITATION OF STRUCTURES (BTCE7047)

Unit - I

Condition Assessment – Procedure for assessment – survey – Field visits – inspection – Sampling – structural capacity – load testing – condition assessment of structures – NDT methods – Evaluation and health monitoring.

Unit - II

Agencies causing material deterioration - shrinkage, settlement, weathering, chemical attack, creep, fire, honey combing etc., durability of materials –Safety evaluation of existing structures

Unit - III

Structural and non-structural cracks -Types of structural distress in foundations, roofs, floors, walls etc.

Unit -IV

Repair Techniques - Materials for repair – Repair of concrete structures - bridges and water retaining structures – water proofing methods and materials - Non-structural repairs.

Unit - V

Factors influencing corrosion of steel – Corrosion protection of steel structures – Masonry deterioration, Biocidal treatment and use of preservatives – Factors influencingdeterioration of wood, use of sealants and adhesives and their role in repair of structures.

Text Books

1. Ransom,W.H., Building Failures, E&FN SPON Ltd., 1981.
2. Perkins.P, Repair, Protection and Waterproofing of Concrete Structures , E & FN SPON,London

Reference Books

1. Moskvin.V., Concrete and Reinforcement Concrete Deterioration and Protection, MIR Publishers, 1983.
2. Richardson,B.A., Remedial Treatment of Buildings, Construction Press, 1989.

GROUND WATER HYDROLOGY (BTCE7048)

Unit -I

Introduction: Utilization of Groundwater - need for ground water, advantages of Groundwater and Groundwater in Hydrological cycle - types of aquifers, GroundwaterMovement: Porosity - Specific yield - Storage coefficient - Permeability and transmissibility

- Laboratory and field measurement of permeability. Basic Principles and Fundamental Equation of continuity - Darcy's law - General differential equation governing groundwater flow for steady and unsteady flows - Application to aquifers -

Flow nets.

Unit -II

Well Hydraulics: Steady flow to a well in a confined aquifer, unconfined aquifer and a leaky confined aquifer - Unsteady flow to a well in a confined aquifer, an unconfined and a leaky confined aquifer-Effect of storage in a well of finite diameter - Partially penetrating wells - Method of images - Analysis of pump test data for the above aquifers
- Problems.

Unit -III

Water wells: Types of wells - well design - construction - well development - Testing of wellsfor well yield - well completion and sanitary protection of wells.

Unit - IV

Model studies of Groundwater: Sand models - Electrical analog models -Viscous models - Membrane - Digital computer models, application of F.D. and F.E. methods (ElementaryTreatment only).

Unit - V

Exploration Techniques: Different methods of Groundwater exploration. Artificial Recharge: Necessity - Different methods of artificial recharge - Selection of method - Examples of artificial recharge schemes adopted in India and abroad.

Text Books

1 Todd . D.K., Groundwater Hydrology, Johnwiley and Sons, New York.
2. Raghunath, H.M. ,Ground water, Wiely Eastern, New Delhi, 1989.

Reference Books

1. Jacob Bear , Hydraulics of Groundwater, McGraw Hill, 1979.
2. Walton W.C., Groundwater Resources Evaluation, McGraw Hill Book Co., New York.
3. Abdel, Aziz Ismail Kashef, Groundwater Engineering, McGraw Hill Book Co., New York.

ELECTIVE III (BTCE706X)

BRIDGE ENGINEERING (BTCE7061)

Unit - I

History and Development of Bridges, Classification of Bridges-Investigations for culverts and minor bridge, Investigations for major bridge – Topography, catchment, hydrology, Geotechnical aspects, Construction Resources – Design Flood Discharge-Methods, Linear waterway.

Unit - II

Choice of Foundation for piers and abutments –Types - relative suitability. Load on Foundation - Well foundation – types –Design well foundation – Scour Depth – Stability ofwell foundation - well sinking - methods – Tilt correction – Case studies

Unit - III

Loading standards for road and railway bridges- Setting out for piers and abutments, Minor Bridges and Culverts, Single span Bridge, Multispan Bridge, Major/Important Bridges.

Unit - IV

Bridge superstructure – supports and centering for RC bridges – erection process of RCgirders and steel girder bridges .

Unit - V

Maintenance-Inspection of bridges, Maintenance of substructure girders-Load testing on bridges- Temporary and movable bridges- Re-building of bridges- bridge failure.

Text Books

1. Ponnusamy S, "Bridge Engineering" Tata McGraw Hill Publishing Co., New Delhi , 2008

Reference Books

1. Whitney, C.S, Bridges, Greenwich House,1983
2. Singh, V.P Wells and Caissons, Nemchand & Sons,1979

HYDRO POWER ENGINEERING (BTCE7062)

Unit - I

History and types of water power development: History of water power development - water power development in India - Comparison of water power with thermal, nuclear and wind mills - Classification - High, Medium and Low Head schemes - Run off river plants

- Storage power station - Tidal power plant - Recent experiences in wave power development - Underground power plants - Pumped storage schemes - Small and miniHydropower systems - Power demand - Role of Hydropower in a grid.

Unit - II

Planning and Layout of Hydropower schemes: Investigation connected with hydropower development - Site selection, layout of hydro power plant- Capacity - Load factor andLoad curve.

Unit - III

Design of Hydroelectric works: Necessities for the construction of a dam - Selection oftype of Dam - Spillway, types and design – In take works, types - Design of Intake transition - Trashrack - Design of power canals and penstocks, penstock joints supportstructures, Elements of laying penstock lines – Water hammer - Rigid and elastic column theory - Characteristics Methods of determining pressure surges in penstocks – surge tanks

Unit - IV

Selection of suitable type and number of turbines - Layout and spacing of turbines. Types and spacing of turbines, tanks, and design, Power house - Types - Layout and spacing of units. Economics of Hydropower Installation: Basic factors in economic Analysis -, Cost of Hydroelectric power.

Unit - V

Mini Hydropower Systems: Small and min hydropower systems - Site selection, Hydrologic computations, Site development, Environmental Impact - Economic and Financial Feasibility.

Text Books

1. Bhattacharya, P.K., Water Power Engineering, Khanna Publishers, 2002.
2. Desmukh, M.M., Water Power Engineering, Dhanpat Rai & Sons, 2002.

Reference Books

1. Brown, G,, Hydroelectric Engineering Practice, CPS, 1984.
2. Fritz, J.J, Small and Mini Hydropower Schemes, McGraw Hill, 1984.
3. Creager and Justin, Hydro electric Hand Book, John Wiley.
4. Das, M.M Saikia, M.S Irrigation and water Power Engineering. PHI Learning. Pvt. Ltd,2009

SITE INVESTIGATION METHODS AND PRACTICES (BTCE7063)

Unit - I

Objections, site investigation in Civil Engineering process, problem solving and various stages in site investigation process. Planning and Desk Study - topographic maps, aerial photographs, applications in site investigation and interpretation of aerial photographs, Geological maps, soil and planning maps, site reconnaissance and local enquiries.

Unit - II

Geological methods - different stages, Geological exploration methods - General principle distribution of physical field in subsurface - Electrical resistivity, Seismic refraction methods, their principle, methods of survey, correction to field data, Interpretation and limitations. Index and Mechanical properties of rocks, Laboratory and insitu tests.

Unit - III

Trial pits, shafts, tunnels, auguring, and different types of drilling methods, their merits and demerits, Bore hole logging techniques (subsurface geophysical exploration) - Need for logging techniques, classification and different types logging methods.

Unit - IV

Soil Exploration methods, samples, sampling procedure, sample disturbances, samplers, Factors controlling spacing and depth of bore hole, Insitu tests, SPT, SCPT, Pressure metertests, interpretation and application, Laboratory testing, Index properties.

Unit - V

Technical Report writing, report format, recommendations for earth work structures, highway excavations and drainage works, dams, check report site preparation, investigation during construction and operation.

Text Books

1. Joyce, M.D. 'Site Investigation Practice;, ESFN. SPON Publishers, 1982.

References Books

1. Hunt, R.E., Geotechnical Engineering Analysis and Evaluation, McGraw HillBook Company, 1986.
2. Bell, Fundamentals of Engineering Geology, Butterworth and Co., London, 1983.
3. Blyth, F.G.H. and De Freitas, M.H., A Geology for Engineers, Edward - Arnold publishersLtd., 1984.
4. Legget and Karrow, Hand book of Geology in Civil Engineering, McGraw HillPublishers, 1983.

HIGHWAY AND AIRPORT PAVEMENT DESIGN (BTCE7064)

Unit - I

Introduction: Pavement types, components, highway and airport pavements, complexities in pavement design. Design Factors: Sub grade - Significance, soil classification, assessment of strength characteristics, Traffic Loads, Climatic factors - variation in moisture content and applications, wheel load stresses, wheel load configurations in highway and airport pavements, ESWL, repetition of loads and EWL factors, transient loads. Problems.

Unit -II

Pavement materials Characterization – Introduction. Soil- characterization, tests. Aggregates- tests, batch mixing. Bituminous – types of bitumen, tests. Bituminous mixes– design. Cement – tests, design of PQC. Soil stabilization – introduction, methods of stabilization.

Unit - III

Flexible pavement Design Methods: General design approaches; Design methods for highway and airport pavements - Group Index, FAA, CBR, Wyoming, Stabilometer, Triaxial test Mc Leod and by Burmister's two layer theory. Problems.

Unit - IV

Stresses in Rigid Pavements and Design: Stresses due to wheel load and temperature, Westergard's analysis, ESWL in rigid pavements, spacing of joints in CC Pavements, thickness design method, IRC design method for highway Pavement, Design of expansion and longitudinal joint details.

Unit - V

Pavement Evaluation and Testing: Pavement failures; Structural evaluation and strengthening of flexible pavements - CBR and plate load tests, Benkelman beam rebound deflection method, strengthening of rigid pavements, Pavement surface condition evaluation, Testing techniques for flexible and rigid pavements.

Text Books

1. Sharma, S.K., Principles,Practices and Design of Highway Engg. S.Chand & Co., NewDelhi. 2002.

2. Justo, C.E.G, S. K. Khanna, Highway Engineering, S. Chand Publishers, New Delhi, 2006

Reference Books

1. Partha Chakroborthy and Animesh Das, "Principles of Transportation engineering,Prentice Hall of India Pvt. Ltd., New Delhi – 110001, 2003
2. Michel Sargious, "Pavements and surfacing for Highways and Airports", Allied Sciencepublishers Ltd. London, 2006.
3. Yang Huang, "Pavement analysis and design", Allied Publishers Ltd. London, 2006.
4. Yoder, Principles of Pavement Design, John Wiley & Sons, 2003

MATRIX METHODS OF STRUCTURAL ANALYSIS (BTCE7065)

Unit - I

Matrix flexibility method – Transformation of forces – Element flexibility to system flexibility. Analysis of statically indeterminate beams and rigid jointed plane -frames – effect of support settlements and elastic supports.

Unit -II

Matrix flexibility method Analysis of pin–jointed frames –effects due to lack of fit and temperature changes. Application to space frames – Direct flexibility approach.

Unit -III

Matrix stiffness method – Transformation of displacements – Elements stiffness to systemstiffness – Application to continuous beams – effects of support settlements and elasticsupports.

Unit - IV

Matrix stiffness method — Application to pin-jointed plane frames - support settlements –lack of fit and temperature effect. Analysis of three dimensional pinned frames.

Unit - V

Special analysis techniques – Condensation, Substructuring – reanalysis techniques – transfer matrix method. Analysis of frames with semi rigid connections.

Text Books

1. Pandit, G.S. and Gupta, S.P., Structural Analysis – A Matrix Approach, Tata McGraw HillPublishing Co., New Delhi, 1997.
2. McGuire, W., and Gallagher, R.H., Matrix Structural Analysis, Lohn Wiley & Sons, NewYork, 1998.
3. Rajasekaran, S., and Sankarasubramaninan, G., Computational Structural Mechanics, Prentice Hall of India Pvt. Ltd., New Delhi, First Edition 2001.

Reference Books

1. Wang, C.K., "Intermediate Structural Analysis", McGraw Hill Publishing Co., New York, 1989.
2. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co., New Delhi,1996.

WATER RESOURCES SYSTEM ENGINEERING (BTCE7066)

Unit -I

Introduction: Scope and steps in systems Engineering - History of systems approach to water resources planning and management - Role of optimization models.

Unit-II

Optimization Techniques: Introduction to optimization - Classical optimization techniques, single and multivariable optimizations with and without constraints - Linear programming,simplex and revised simplex methods.

Unit -III

Duality in linear programming - Non linear programming - Dynamic and mixed integer programming - application of simulation techniques to water resources systems - Statistical decision theory and queueing theory.

Unit -IV

Application to water resources engineering: Objective and valuation criteria - input and demand analysis - System element and planning of subsystem, conveyance and storage subsystems and Irrigation system.

Unit - V

Application of various optimization techniques to water resources systems.

Text Books

1. Chaturvedi,M.C., Water Resources Systems Planning and Management, T.M.H., 2001.

Reference Books

1. Rao, S.S., Optimization theory and applications, Wiley Eastern Ltd., New Delhi ,2002
2. Stank,R.M,, Nicholls,R.L., Mathematical foundations for design, McGrawHill Publishers Co., 1972.
3. Kottegoda.,N.T., ,Stochastic water Resources Technology, Macmillan, 1980.
4. James.L.G., Principles of Farm Irrigation System design, John Wiley and Sons, 1980.

List of electives to be offered in 8th Semester (BTCE804X)

ADVANCED STRUCTURAL DESIGN – STEEL (BTCE8041)

Unit - I

Design of Portal Frames and Gable Frames

Unit - II

Chimneys: Design of Self Supporting Chimney- Design principles of Guyed Chimney

Unit - III

Microwave and Transmission Towers: Introduction – Loads- Analysis of Microwave & Transmission Towers- Design of members- Design of Foundations- Design of Connections.

Unit - IV

Design of steel storage structures – pressed steel tank – tanks with hemispherical bottom and supporting structures.

Unit - V

Introduction to design of semi rigid connections – cold formed steel structures – Pre-Engineered buildings- Construction: Tolerances: Fabrication tolerances- Erection Tolerances, Erection methods and stresses.

Text Books

1. Ram Chandra, " Design of Steel Structures", Vol.II, Standard Book House, New Delhi.
2. Ramamrutham S., " Design of Steel Structures", Dhanpat Rai Publishing Co., New Delhi,2001
3. Edwin H., Gaylord, Jr., Charles N. Gaylord, "Design of Steel Structures", Mc Graw Hill,Inc., Singapore, ISBN 0 -07-112623-6
4. Arya A.S.& Ajmani A.L.," Design of Steel Structures", Nemchand and Brothers , Roorkee

Reference

1. Steel Structures- Design and Behaviour - C.G. Salmon & J.E.Johnso- Harper and Row, Cambridge, 1980

OPTIMIZATION TECHNIQUES FOR CIVIL ENGINEERING (BTCE8042)

Unit - I

Introduction: Introduction to optimization Techniques - problem formulation and merit function. Linear Optimization: simplex Algorithm duality in Linear Programming.

Unit - II

Non-Linear Optimization- I: Single and multiple variable optimization algorithms, Search methods, gradient methods.

Unit -III

Non-Linear Optimization-II: Multi variable optimization Algorithms, constrained and unconstrained problems - search methods, gradient methods, Kuhntucker conditions.

Unit -IV

Dynamic programming Concepts: Backward recursion method - genetic programming, principle and concepts, simulated ANN, genetic Algorithms

Unit - V

Computer application in optimization: Optimization software for various Civil

Engineeringproblems.

Text Books

1. Ossenbruggen, P.J., Systems analysis for Civil Engineering, John Wiley & Sons, 1984.
2. Rao., S.S Optimization theory and applications, Wiley Eastern Ltd., New Delhi, 1985.
3. Majid,K.I., Optimum Design of Structures, Butter-Worth and Co., Ltd., London, 1974.

Reference Books

1. Kalyanmoy Deb, Optimization for Engineering Design, Prentice Hall of India, Private Ltd., New Delhi, 1996.

ADVANCED OPEN CHANNEL FLOW (BTCE8043)

Unit -I

Introduction: Geometrical Elements of open channel - Velocity distribution, Coefficients and their determination - Pressure distribution.

Uniform Flow: Energy and momentum Principles applied to prismatic and non-Prismatic channels - Critical flow - Computation and applications. Uniform flow-Manning's and Chezy's equations, Determination of Manning's and Chezy's constants - Computation of uniform flow - Applications of uniform flow concepts, Design of channels for uniform flow -Non-Erodable channels.

Unit -II

Gradually Varied Flow: Theory and analysis, methods of computation,, graphical integration, direct integration, direct step and standard step methods - Computer applications.

Unit -III

Spatially varied flow: Spatially varied flow - Dynamic equation, analysis flow profile, Numerical integration and isoclinal method.

Unit - IV

Rapidly Varied Flow: Rapidly varied flow - characteristics - Flow over spillways.

Unit - V

Unsteady Flow: Unsteady flow – Dynamic equation for unsteady gradually varied flow,uniformly progressive flow - Wave propagation. Rapidly varied unsteady flow - Moving hydraulic pump - positive and negative surges - Surges in power canals, Navigation canals, transitions & Canal junctions.

Flood Routing: Introduction to Flood routing.

Text Books

1. Subramanya, K., Flow in Open channels, TMH, 2007.
2. Ranga Raju, K.G., Flow through open channels, TMH, 2007.

Reference Books

1. Chow, V.T., Open Channel Hydraulics, ISE, McGraw Hill, 1986.
2. French,R.H., Open Channel Hydraulics, ISE, McGraw Hill, 1986.
3. Das, M.M., Open Channel Flow, Prentice Hall of India (P) Ltd, 2008.

MACHINE FOUNDATIONS (BTCE8044)

Unit -I

Introduction, nature of dynamic loads free vibrations of spring mass systems, forced vibrations viscous damping, principles of vibration measuring equipments.

Unit -II

Dynamic properties of soils: Elastic properties of soils, coefficient of elastic uniform and non uniform compression and shear, effect of vibration on the dissipative properties ofsoils , determination of dynamic properties of soils , Codal provisions.

Unit - III

Analysis and design of block type machine foundations: Review of methods for dynamicanalysis- modes of vibration, foundations for machines inducing periodical forces and impact type forces.

Unit - IV

Design of framed foundations for high speed machinery: Special consideration in planning, principles design criteria, structural design- foundations for miscellaneous machines.

Unit - V

Vibration isolation, passive and active isolation, use of springs and springs and dampingmaterials, construction aspects of machine foundations.

Text Books

1. Barkon,D.D., Dynamics of basis of foundation, MGH,1974.
2. Bowle's.J.E., Foundation Analysis and design,4th

edition,MGL,1998.Reference Book

1. Arora.K.R., Soil mechanics and foundation Engineering, SPD,2001

EARTH RETAINING STRUCTURES (BTCE8045)

Unit -I

Introduction, development of earth pressure theory, classical solutions, graphical techniques, active ,passive cases, earth pressure due to external loads, Empirical approaches, arching of soil pressure in soils, grain elevators and coal bunkers.

Unit - II

Soil properties for retaining walls, forces on retaining walls, stability of retaining walls.Design of gravity and semi gravity , counter fort, cantilever retaining walls.

Unit - III

Types of sheet pile walls, analysis of cantilever and anchored sheet pile walls, Row's theory and moment reduction, soil pressure on braced sheeting.

Unit - IV

Types and uses of coffer dams- analysis and design of cofferdams and design of diaphragm cofferdam, construction methods of double wall sheet pile cofferdams and moveable cofferdams.

Unit - V

Shoring and underpinning- earth pressure measuring techniques- load test on anchors prevention of slope failure.

Text Books

1. Das, B.M., Principles of foundation Engineering, PWS, Kent and Co,1999.
2. Arora.K.R., Soil mechanics and foundation Engineering,SPD,2001

Reference Books

1. Bowle's.J.E., Foundation Analysis and design,4th edition,MGL,1998.

AIR AND NOISE POLLUTION (BTCE8046)

Unit - I

Introduction: Definition of clean air –air pollutants - Sources and classification
Effects of air pollution on man, animal, vegetation and properties -Ambient Air QualityStandards, Air pollution control legislation.

Unit - II

Meteorology and Air pollution – Atmospheric stability – Inversions – Mixing height – Plume behaviour – Plume rise estimation – Effluent dispersion theories –Air pollutants Modelling.

Unit - III

Control of Air pollutants: particulates – Filters – Gravitational settling chambers – Centrifugal-multiple type cyclones – Collection efficiency - Electrostatic precipitators –Wet collectors-Centrifugal spray scrubbers - Venturi scrubbers.

Unit - IV

Gaseous pollution control – Absorption - Principles – Description of equipment, Adsorption
– Principal adsorbents – Equipment descriptions – Condensation – Contact condensers Incineration –Equipment description

Unit - V

Sound and noise - Source of noise pollution - Environmental and industrial noise -Effects of noise pollution - Fundamentals of sound - generation, propagation, etc., Sound measurement, sound level meters – Measures for prevention and control of noise - Environmental and industrial noise - Noise control legislation.

Text Books

1. Rao.M.N. et al., Air Pollution, Tata Mc.Graw Hill, 1998.
2. Environmental Pollution Control Engineering By C.S. Rao, New Age

International Publishers, 2006

Reference Books

1. Noel de Nevers, Air Pollution Control Engineering, Mc.Graw Hill, New York. 1995.
2. Stern, A.C., Air Pollution , Vol.I, II and III, Academic Press, 1962.
3. Cunniff, P.F., Environmental Noise Pollution, John Wiley and Sons, New York, 1981.

ENVIRONMENTAL IMPACT ASSESSMENT (BTCE8047)

Unit -I

Historical perspective of environmental protection laws and acts in India - Definition of EI, EIA, EIS - Industrial policy statement of the Government of India. Legal and Regulatory aspects in India - Types and Limitations of EIA - Minimum National Standards – Bureau of Indian Standards - WHO standards.

Unit -II

EIA methodologies – Appropriate Methodologies, Quantification, - Cost benefit analysis - Risk assessment, Test Model format - Preliminary assessment

Unit -III

Air quality impact: Background - Typical considerations and factors, air quality impact of industry, transport systems, mitigation methods. Water quality impact: Water quality criteria and standards, Field Surveys water quality- impacts by developmental projects – Land and soil quality impacts- Soil fertility and remediation. Noise impact: Noise and sound, the effects of noise on people, noise scales and rating methods, estimating transportation noise impact.

Unit - IV

Energy Impact: Energy impact considerations, data sources, energy conservation data, EIA of hydro, thermal and nuclear power plants, Vegetation and Wild life impact: Biological concepts and terms, impact on flora and fauna, mitigating measures,alternatives - Types, steps in performing socio economic impact assessment, analysis ofpublic services and facilities, impacts, social impacts

Unit – V

Summarization of environmental impacts - Environmental Management plan, Public involvement - impacts of economic profile of the community, Exchange of information -comparison of alternatives- Training

References Books

1. Canter, L.W., Environmental Impact Assessment, Mc Graw Hill, New York, 1996.
2. Petts, J., Handbook of Environmental Impact Assessment Vol.I and II, Blackwell Science, London, 1999.
3. Environmental assessment of development projects, United Nations Asia and Pacific Development Centre, Kuala Lampur, 1983.
4. John, G. Rau and David C. Wooten (Ed), Environmental Impact Analysis Hand Book, McGraw Hill Book Co., 1980.

5. Peter Wathern (ed), Environmental Impact Assessment, Theory and practice, Unwin Hyman Ltd., London,1988.
6. Munn,R.E., (ed), Environmental Impact Assessment, Principles and Procedures, Published on behalf of SCOPE, Unwin Brothers Ltd., London

DOCK AND HARBOUR ENGINEERING (BTCE8048)

Unit -I

Growth and regulation of Ports: History of Port – Classification of Harbours - Factors affecting the growth of Port. - Requirement of a Harbour - General Planning – Port capacity –traffic analysis - Berth occupancy – financial evaluation - EIA - Description of selected Indian ports.

Unit -II

Harbour Planning (Technical) Site investigation – harbour entrance - Navigational Channel – Depth of harbour – Turning basin – Anchor basin – berthing area – Storage area - Shipping terminal facilities – Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals.

Unit -III

Introduction to ocean waves – Wave transformation – Wave and wind climate inside Harbour - Break waters: Types – Factors determining their selection – Forces on break waters – Design of rubble mound and vertical break waters – Physical Model Studies.

Unit - IV

Berthing structures – Types – Loads – Selection of berthing structures – Design principles of diaphragm walls, dolphins and piles. Selection and Design principles of Dock fenders and Mooring accessories.

Unit - V

Design principles of dock structures - Graving dry dock – Slip way – floating dry dock -Monitoring and repair of harbour structures - Dredging - Navigational aids – Light house.

References

1. Harbour and Coastal Engineering (Indian Scenario) Vol - I & Vol – II; S. Narasimhan & S. kathiroli, NIOT- Chennai
2. Design and construction of Port and marine Structures – Alonzo Def. Quinn – McGraw –Hill book Company
3. IS: 7314 1974 - Glossary of terms relating to Port and harbour Engineering.
4. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part – I) SiteInvestigation.
5. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part – II) EarthPressure.
6. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part – III)Loading.

TRAFFIC ENGINEERING AND MANAGEMENT (BTCE8049)

Unit -I

Elements of Transportation Engineering : vehicle characteristics like weight , size, turning radius, concept of design vehicle. Human and Driver characteristics – PIEVE theory, comfort, concept of design driver. Road characteristics – surface conditions, slopes andcurves. Control mechanisms. Terminal facilities.

Unit -II

Highway geometric design : introduction, road cross section parameters. Horizontal curves, vertical curves, channelization design. Fundamentals of traffic flow, uninterrupted traffic flow, Interrupted traffic flow, speed studies and analysis, Highway capacity studies and analysis,

Unit -III

Traffic Signal: Fixed and vehicle actuated signals - Optimum cycle length - Warrants for signals - Saturation flow - Signal co-ordination - Area traffic control - Design of signalized and un-signalized intersections. Design of interchanges, Design of roundabouts. Roadsigns- test of the sign. Lettering and placement of signals.

Unit -IV

Traffic Regulation and Safety: Regulation of speed - Vehicle and road users – Parkingregulations - Parking and Traffic Control : Parking studies - Design of parking lots - Traffic signs - Road markings at different locations - Speed breaker Accident investigation - Accident data analysis.

Unit - V

Traffic Management: Legislation enforcement and education for traffic safety, Cost of road accidents, Measures for accident reduction Segregation of traffic, Tidal flow operation, Exclusive bus lane, oneway streets, Street lighting, Noise barrier.

Text Books

1. Kadiyali,L.R., Traffic and Transportation Engineering, Khanna Technical Publications,Delhi, 2003.
2. Khanna, K and Jussto C.E.G., Highway Engineering, Khanna Publishers,Roorkee , 2006.

Reference Books

1. Worfgang.S., Hamburger, Transportation and Traffic Engineering Hand Book,Prentice-Hallo,New Jersey, 2002.
2. Louis,J Pignataro, Traffic Engineering - Theory and Practice, Prentice-Hall Inc., New Jersey, 2003.
3. James.L. Pline, Traffic Engineering Hand Book, Prentice Hall, New Jersey, 2002.
4. Salter. S. A. Highway Traffic analysis and design, Prentice Hall, New Jersey,2003

PHOTOGRAMMETRY AND REMOTE SENSING (BTCE80410)

Unit -I

Introduction: History – distinction between aerial & terrestrial photographs – comparison of map and aerial photographs.

Unit -II

Aerial cameras – single vertical aerial photographs – coordinate system – comparators – scale of vertical aerial photograph – relief displacement.
Stereoscopic viewing – stereoscopes – vertical exaggeration – parallax bar – height determination. Elementary method of map making – radial line triangulation – mosaics – types of mosaics and its uses. Tilted photographs, oblique photographs, rectification, ortho photographs (elementary treatment only).Fight planning-end lap and side lap – scale, flying height, season year.

Unit -III

Photographic interpretation: Fundamentals of Aerial photo interpretation – photographic elements – interpretation keys.

Unit -IV

Introduction to Remote Sensing: Definition-history-electromagnetic radiation-reflected and emitted electromagnetic energy-interaction of EMR with atmosphere and Earth surface – platforms-sensors-types of satellites and their orbits, Image enhancement, Image classification.

Unit - V

Application of Photogrammetry & Remote Sensing: Application of aerial photographs and satellite imagery – merits – applications in highway engineering, environmental engineering, water resources engineering, topographic mapping and geology.

Text Books

1. Wolf,P.R., Elements of Photogrammetry, McGraw Hill Inc., 1983.
2. Lillesand,T.M., and Kiefer,R.W., Remote Sensing and Image Interpretation, John Wiley and Sons, New York, 1979.

PREFABRICATION AND CONSTRUCTION TECHNIQUES (BTCE80411)

Unit -I

Materials, admixtures, pigments – Modular Co-ordination and standardization, System of pre fabrication-Principles of production techniques.

Unit -II

Precast concrete components – Precasting and Prefabrication techniques, Planning, analysis and design considerations – Handling techniques – Transportation and erection of structures.

Unit - III

Skeletal and large panel construction, space structures – Joints in construction – curing techniques.

Unit - IV

Appropriate technology for cost effective techniques for roof, wall, door, water tanks etc.

Unit - V

Quality control –Repairs and economical aspects in prefabrication.

Text Books

1. Livitt, H.M. Precast concrete – Materials, manufacture, Properties and usage, Appliedscience publications, 1992.
2. Richardson, J.G., Precast Concrete Production, Cement and Concrete association,London, 1973.
3. Bruggeling, A.S.G., Huyghe, G.T., Prefabrication with concrete, A.A.Balkama Publishers, U.S.A., 1991.

Reference Books

1. Madhava Rao, A.G., et.al. – Modern trends in housing and developing countriesOxford & I B H Publishing Co., 1985.
2. Levicki, B., Building with Large Prefabrications, Elsevier Publishers.
3. Large Panel Prefabricated Constructions, Proc. of course conducted by SERC,Chennai.

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES (BTCE80412)

Unit - I

Elements of seismology - Definitions of Magnitude, Intensity, Epicenter, etc., General features of tectonics of seismic regions, Seismographs. Seismic zones as per IS 1893-2002.

Unit - II

Theory of vibrations - Free vibrations of single degree, two-degree and multiple degree freedom systems, damping ratio, logarithmic decrement , Transmissibility, Response spectra

Unit - III

Principles of earthquake resistant design – Methods of dynamic analysis – Choice of themethod - Architectural requirements of buildings – Plan and vertical irregularities .

Unit - IV

Behaviour of reinforced concrete and steel elements under cyclic loading – Confinement- Ductility and absorption of energy- Introduction to Indian Standard Codes - IS:4326 – 1993 and IS:13920-1993.

Unit - V

Design of RC frames for earthquake loads – calculation of loads as per IS 1893 – 2002 –

Load combinations - Design of beams and columns for earthquake resistance.

Textbooks

1. Pankaj Agrarwal & Manish Shrikhande "Earthquake resistant Design of Structures"Prentice Hall of India Pvt Ltd. New Delhi, 2007.
2. Mario Paz. "Structural Dynamics – Theory & Computations" CSB Publishers & DistributorsShadhdara, Delhi 1985.

Reference Books

1. Anil K.Chopra, "Dynamics of Structures Theory and Applications to EarthquakeEngineering" Prentice Hall of India (P) Ltd., New Delhi 1996.
2. Pauley T and Priestley M.J.N, Seismic Design of Reinforced Concrete and MasonryBuildings, John Wiley & Sons, New York, 1992.
3. Stratta, J.L "Manual of seismic Design" Prentice Hall Inc. NJ 1987.

STRUCTURAL DYNAMICS (BTCE80413)

Unit - I

Single – Degree of Freedom Systems, Analytical Models, Equation of Motion, Free Vibration, Damping, Types of damping, Types of damping, Response to harmonic loading, Resonance, Support motion, Transmissibility, Vibration isolation .

Unit - II

SDOF system subjected to periodic & impulsive loading, Fourier series loading, Rectangular pulse, Introduction to Frequency Domain analysis

Unit -III

SDOF systems subjected to general dynamic loading, Duhamel's integral, Application to simple loading cases, numerical evaluation of response integral.

Unit - IV

MDOF systems, selection of DOFs, formulation of equations of motion, Structure matrices, Static condensation, Free Vibration Eigen Value problem, Frequencies and Mode Shapes, Determination of natural frequencies and mode shapes by Stodola-Vianello method, Rayleigh method Orthogonality conditions.

Unit- V

Distributed- parameter Systems Free and forced Vibration of beams .

Text Books

1. Chopra A.K. , Dynamics of Structures, Dhanapat Rai & Sons, New Delhi.
2. Structural Dynamics - Mario Paz, CBS Publications, New Delhi.

References

1. Clough R. M. and Ponian, Dynamics of Structures –,McGraw Hill co.New Delhi.
2. Craig R.R , Structural Dynamics – An Introduction to Computer Methods, John Wiley and Sons, 1981.

THEORY OF ELASTICITY AND PLASTICITY (BTCE80414)

Unit - I

Analysis of stress and stain - state of strain at a point - compatibility equations - generalized Hooke's Law - plane stress and plane strain.

Unit - II

Airy's stress function - polynomials - biharmonic equations - Two dimensional problems in carterian co-ordinates- Bending of a simple beam under uniform load – Triangular Gravity Wall .

Unit - III

Solution of plane problems in Polar coordinates – Differential equation in polar coordinates – Hollow cylinder subjected to uniform pressure – Pure bending of curved beams – Rotating Disks

Unit - IV

General solution of problems - Torsion of prismatic bars by displacement (warping function) force (Prandtls stress function) torsion of shafts of circular and non circular cross sectional shapes only (Elliptic, Triangular and Rectangular) - Torsion of thin rectangularsections and hollow thin walled sections.

Unit - V

Introduction to problems in plasticity - Physical assumption - Criterian of yielding - Rankine theory - St. Venant's theory - Flow rule (Plastic stress - strain relationship - Elastic Plastic problems of beams in bending - plastic torsion - sand heap analogy.

References

1. Chakrabarty, "Theory of Plasticity", Tata McGraw Hill Book Co., New Delhi, 1975
2. Wang. C.K., "Applied Elasticity", Mc Graw Hill, New Delhi, 1990
3. Timoshenko.S. and Goodier. J.N. "Theory of Elasticity" Mc Graw Hill Book Co., New York,1988
4. Sadhu Singh "Theory of Elasticity" Khanna Publishers, New Delhi, 1988
5. Zhilun Xu , “Applied Elasticity”, Wiley Eastern Limited, New Delhi,1980

DESIGN OF INDUSTRIAL STRUCTURES (BTCE80415)

Unit - I

Classification of Industrial Structures -Layout requirements –lighting and Ventilation - protection against noise and vibration - fire safety - factories act.

Unit - II

Roofing configuration – types of trusses - Beams and lattice trusses - Type of roof covering materials - purlins - detailed design.

Unit - III

Silos and Bunkers - Shape of hopper for different materials - design of vertical sides -

hopper bottom - stiffening girder - staging -design - Conveyors and supporting structures.

Unit - IV

Gable frames of uniform cross sections - varying depth – pin-jointed knee bracings - design of joints - analysis by various methods.

Unit - V

Load Analysis and design of Transmission line Towers - Substation structures - Foundation analysis - Design Principle only.

Reference Books

1 Punmia .B.C.,. Jain A.K, Arun Kumar Jain ,"Comprehensive R C C Designs", Laxmi Publications (P) Ltd., New Delhi, 1998

2. Lother, "Advance Design in Steel Structure", Prentice Hall, USA, 1980
3. Salmon. C.G. and Johnson J.E. "Steel Structure - Design and Behaviour", Harper and Row - 1980
4. Wiliam McGuire - "Steel Structures", Prentice Hall of India New Jersey, 1968
5. Arya and Ajmani, "Design of Steel Structures" Nem Chand Bros, Roorkee, 1990
6. Dayaratnam. P. "Design of -Steel Structures", Wheeler & Co., New Delhi, 1999.