Course Scheme & Syllabus

For

B.Tech. in Civil Engineering

1st TO 8th SEMESTER

Session 2018 onwards
### Scheme of Courses
**B.Tech. in Civil Engineering**  
**Semester-1**

<table>
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<tr>
<th>S.N.O.</th>
<th>Paper Code</th>
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<th>P</th>
<th>Cr</th>
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L: Lectures  T: Tutorial  P: Practical  Cr: Credits

### Scheme of Courses
**B. Tech. in Civil Engineering**  
**Semester-2**

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L: Lectures  T: Tutorial  P: Practical  Cr: Credits
DAV UNIVERSITY, JALANDHAR

Scheme of Courses
B. Tech. in Civil Engineering

Semester-3

L: Lectures    T: Tutorial    P: Practical    Cr: Credits

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*Swachh Bharat Summer internship of duration 100 hours in the period of 1 May to 31 Jul

Scheme of Courses
B. Tech. in Civil Engineering

Semester-4

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L: Lectures    T: Tutorial    P: Practical    Cr: Credits

Note: At the end of the examination of 4th Semester the students will undergo compulsory survey camp to be held in hilly area for a period of 2-4 weeks duration. Every student will submit the Camp/Training Report within two weeks from the start of teaching for 5th Semester. The marks for this will be included in the 5th Semester.
DAV UNIVERSITY, JALANDHAR

Scheme of Courses
B. Tech. in Civil Engineering
Semester-5

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L: Lectures    T: Tutorial    P: Practical    Cr: Credits

Scheme of Courses
B. Tech. in Civil Engineering
Semester-6

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L: Lectures    T: Tutorial    P: Practical    Cr: Credits

Note:
- Department specific elective-I should be from the basket of “Department Specific Elective-I”.
- At the end of the examination of 6th Semester the students will undergo compulsory industrial training for a period of 6 weeks duration in reputed industries. Every student will submit the training report within two weeks from the start of teaching of 7th Semester. The marks for this will be included in the 7th semester.
### Scheme of Courses
**B. Tech. in Civil Engineering**
**Semester-7**

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L: Lectures  T: Tutorial  P: Practical  Cr: Credits

**Note:**
- Department specific elective-IV,V,VI & VII should be from the respective basket of “Department Specific Electives”.
- Generic elective-I should be from the “Generic Elective Basket”

### Scheme of Courses
**B. Tech. in Civil Engineering**
**Semester-8**

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L: Lectures  T: Tutorial  P: Practical  Cr: Credits

**Note:**
- Department specific electives should be from their respective basket
- Generic elective-II should be from the “Generic Elective Basket”

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# Department Specific Elective-I

<table>
<thead>
<tr>
<th>S.N O.</th>
<th>Paper Code</th>
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Objective: The aim of this course is to familiarize the students with the theory of matrices which are used in solving equations in mechanics and the other streams. This course also provides a comprehensive understanding of the origin and development of ideas to exhibit the techniques of solving ordinary differential equations.

PART-A

PART-B

PART-C
Formation of ordinary differential equations, solution of first order differential equations by separation of variables, Homogeneous equations, Reduce to Homogenous, exact differential equations, equations reducible to exact form by integrating factors, equations of the first order and higher degree, Clairaut's equation.

PART-D
References:

Course Title: Chemistry
Course Code: CHE151

Course Objectives:
The objective of the Engineering Chemistry is to acquaint the student with the basic phenomenon/concepts of chemistry for the development of the right attitudes by the engineering students to cope up with the continuous flow of new technology. The student will able to understand the new developments and breakthroughs efficiently in engineering and technology.

Expected Prospective:
This course will equip students with the necessary chemical knowledge concerning the fundamentals as well as new technology in the field of chemistry.

PART- A

Spectroscopy and its Applications

General Introduction: Introduction, electromagnetic spectrum, absorption and emission spectrum, atomic and molecular spectroscopy, types of molecular spectra, experimental techniques, selection rules, width and intensities of spectral lines.

UV/Visible Spectroscopy: types of electronic Transitions, Chromophores, Auxochromes, Effect of conjugation on Chromophores, Factors affecting \( \lambda_{\text{max}} \) and intensity of spectral lines, effect of solvent on \( \lambda_{\text{max}} \), isobestic point, applications.

IR Spectroscopy: Infrared region, fundamental modes of vibrations and types, theory of infrared spectra, vibrational frequency and energy levels, anharmonic oscillator, modes of vibrations of polyatomic molecules, characteristic signals of IR spectrum, finger print region, factors affecting vibrational frequency; applications.

NMR Spectroscopy: Principle and instrumentation, relaxation processes, proton magnetic resonance spectroscopy, number of signals, Chemical shift, Spin-Spin Splitting, coupling constant, applications.

PART - B

Water and its treatment
Introduction, hardness of water, degree of hardness, units of hardness, boiler feed water: specification, scales and sludge formation; priming& foaming, boiler corrosion, caustic
embrittlement, treatment of boiler feed water, internal treatment of water; softening of water by lime-soda, zeolite and ion exchange methods, desalination of water; Water for domestic use: purification of water for domestic use.

Corrosion and its Prevention
Introduction; different types of corrosion - wet and dry corrosion; mechanism of wet corrosion; comparison of dry and wet corrosion, Types of electrochemical corrosion: galvanic corrosion, concentration cell corrosion or differential aeration corrosion, waterline corrosion, pitting corrosion, crevice corrosion, stress corrosion, intergranular corrosion; other forms of corrosion: atmospheric corrosion, soil corrosion, microbiological corrosion, erosion corrosion, Filliform corrosion, stray current corrosion, passivity, galvanic series, factors influencing corrosion, various methods of corrosion control.

PART -C
Chemistry in Nanoscience and Technology
Introduction, Materials self-assembly, molecular vs. material self-assembly, hierarchical assembly, self-assembling materials, two dimensional assemblies, mesoscale self-assembly, coercing colloids, nanocrystals, supramolecular structures, nanoscale materials, future perspectives applications, nanocomposites and its applications.

PART -D
Polymers and polymerization
Introduction, monomer and repeating unit, degree of polymerization, functionality, classification of polymers: based on origin, monomers, structure, method of synthesis, tacticity or configuration, action of heat, chemical composition, ultimate form; types of polymerization, specific features of polymers, regularity and irregularity, tacticity of polymers, average molecular weights and size, determination of molecular weight by number average methods, effect of molecular weight on the properties of polymers, introduction to polymer reinforced composites.
References:

Course Title: Computer Fundamentals and Programming
Course Code: CSE101A

Course Objective: To get basic knowledge of computers (hardware and software), its components and Operating systems. To acquire programming skills in C, basic knowledge of Internet

PART -A

Introduction to Computers
Define a Computer System, Block diagram of a Computer System and its working, memories, Volatile and non-volatile memory, cache, virtual, secondary storage devices-Magnetic Tape, Hard Disk, CD-DVD, Magnetic Disk, Various input devices including keyboard, Mouse, Joystick, Scanners and Various output devices including Monitors, Printers, Plotters

Operating Systems
Computer Software and its types and Hardware, Operating Systems, their types and functions

PART -B

Working Knowledge of Computer System
Introduction to word processors and its features, creating, editing, printing and saving documents, spell check, mail merge, creating power point presentations, creating spreadsheets and simple graphs.

Fundamentals of Internet Technology
Local area networks, MAN and wide area network, Internet, WWW, E-mail, Browsing and Search engines, Internet Connectivity, Network Topology, Hub, Switches, Router, Gateway.

PART -C

Basic Constructs of C
Keywords, Identifiers, Variables, Data Types and their storage, Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Increment & Decrement Operators, Expressions, Conditional Expressions, Assignment Operators and Expressions, External Variables and Scope of Variables, Structure of C Program.
Control Structures
Decision making statements: if, nested if, if – else ladder, switch, Loops and iteration: while loop, for loop, do – while loop, break statement, continue statement, goto statement.

PART -D

Functions
Advantages of functions, function prototype, declaring and defining functions, return statement, call by value and call by reference, recursion, and storage classes.

Arrays and Strings
Declaration of arrays, initialization of array, accessing elements of array, I/O of arrays, passing arrays as arguments to a function, strings, I / O of strings, string manipulation functions (strlen, strcat, strcpy, strcmp)

References:

Course Title: Environmental Studies

Paper Code: EVS100A

Course Objective: This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

PART - A

The multidisciplinary nature of environmental studies
Definition, scope and importance, Need for public awareness

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

Ecosystem:

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

PART - B

Biodiversity and its conservation
- Introduction – Definition: Genetic, Species and Ecosystem Diversity
- Bio-geographical classification of India
- Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, global and national efforts.

Environmental Pollution
- Definition, causes, effects and control measures of:
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear pollution
  - Solid waste management: Causes, effects and control measures of urban and industrial wastes.
  - Role of an individual in prevention of pollution
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- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

PART -C

Social Issues and the Environment
- Environment and human health,
- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Issues involved in enforcement of environmental legislation
- Public Awareness

PART -D

Human Population and Environment
- Population Growth and Variations among Nations
- Population Explosion
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies
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Field Work

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

Suggested Readings:

Course Title: Engineering Drawing
Course Code: MEC101A

Course Objectives: Students will be able to use the techniques to interpret the drawings and to use it in the field work of engineering. They will learn various lines, planes, solids and their sectioning and to develop their lateral surfaces. Concepts of orthographic and isometric projections

PART -A
Drawing Techniques
Introduction to drawing instruments, various types of lines and their convention, principles of dimensioning, Engineering symbols, Gothic lettering in single stroke as per SP-46 code (Vertical and inclined)

Scales
Concept of scaling, construction of plane and diagonal scales

PART -B
Projection of Points
Concept of plane of projections (Principle planes), First and third angle projections; projection of points in all four quadrants, shortest distance problems

Projection of Lines and Planes
Projection of line parallel to both planes, perpendicular to one plane, inclined to one and both the reference planes and their traces. Plane perpendicular to one plane inclined to one and both the reference planes and their traces. Concept of profile plane and auxiliary planes, To find the true length, α, β, θ and Φ.

PART -C
Projection of Solids
Right and oblique solids; solids of revolution and polyhedrons, projection of solid with axis perpendicular to one plane and parallel to one or both reference planes. Projection of solid with axis inclined to one or both reference planes.
Sectioning of Solids
Theory of sectioning, types of section planes, their practice on projection of solids, Sectioning by auxiliary planes, to find true section of truncated solids.

PART -D

Development of Surfaces

Orthographic and Isometric Views
Draw orthographic views from isometric view or vice-a-versa, Missing line and missing view

References:
Course Title: Basic Communication Skills
Course Code: ENG151A

Course Objective:
- To enhance students' vocabulary and comprehensive skills through prescribed texts.
- To hone students' writing skills.

Learning Outcomes: Students will be able to improve their writing skills as well as will enrich their word power.

PART – A
Applied Grammar (Socio-Cultural Context)
1. Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection
2. Tenses (Rules and Usages in Socio-cultural contexts)
3. Modals: Can, Could, May, Might, Will, Would, Shall, Should, Must, Ought to
4. Passive/Active
5. Reported/Reporting Speech

PART – B
Reading (Communicative Approach to be followed)
1. J M Synge: Riders to the Sea (One Act Play)
2. Anton Chekhov : Joy (Short Story)

PART – C
Writing
1. Essay Writing and Letter Writing
2. Report Writing
3. Group Discussion & Facing an Interview

References:

a. Books

b. **Websites**

1. [www.youtube.com](http://www.youtube.com) (to download videos for panel discussions). Web.
Course Title: Chemistry Lab
Course Code: CHE152

Course Objectives:

This course is intended to learn the basic concepts of Engineering Chemistry Laboratory. The present syllabus has been framed as per the recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in Engineering chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals.

List of Practicals:

1. Verify Lambert Beer’s law using spectrophotometer and CoCl₂ or K₂Cr₂O₇ solution.
2. Determine the strength of HCl solution by titrating against NaOH solution conductometrically.
3. Determination of the strength of HCl solution by titrating against NaOH using pH meter.
4. Determination of total hardness of water (tap) using standard EDTA solution and Eriochrome black T indicator.
5. Determination of alkalinity of water.
6. Determination of surface tension of given liquid by using Stalagmometer.
7. Determination of residual chlorine in a water sample.
8. Determination of Flash & Fire point of given a given lubricating oil by Pensky-Marten’s apparatus.
11. Determination of moisture, volatile matter and ash content in a given sample of coal by proximate analysis.
12. Determination of dissolved oxygen present in given sample of water.

References:

2. Yadav, J.B. Advanced Practical Physical Chemistry.
Instruction for Students: The students will be attending a laboratory session of 2 hours weekly and they have to perform the practical related to the following list.

1. Practical know-how of various internal and external Hardware components of a computer (including basic working of peripheral devices).
2. Introduction to Operating Systems; installing Windows; basics of windows.
3. Working knowledge of Internet.
4. Introduction to word processor and mail merge.
5. Introduction to MS-Excel.
6. Working on MS-PowerPoint.
7. Introduction to basic structure of C program, utility of header and library files.
8. Implementation of program related to the basic constructs in C
9. Programs using different data types in C
10. Programs using Loops and Conditional Statements in C
11. Programs using functions by passing values using call by value method.
12. Programs using functions by passing values using call by reference method.
13. Programs using arrays single dimension in C.
14. Program to implement array using pointers
15. Programs related to string handling in C
Course Title: Basic Communication Skills Lab
Course Code: ENG152

Course Objective:
- To improve fluency in speaking English.
- To promote interactive skills through Group Discussions and role plays.

Learning Outcome: Students will get exposure to speaking through the above mentioned interactive exercises. In addition, they will develop a technical understanding of language learning software, which will further improve their communicative skills.

Unit – A Speaking/Listening
1. Movie-Clippings (10 Hrs)
2. Role Plays (10 Hrs)
3. Group Discussions (10 Hrs)

References:

Websites
1. www.youtube.com (to download videos for panel discussions).Web.
Objective:
The objective of the course is to equip the students with the knowledge of concepts of vectors and geometry and their applications. A flavour of pure mathematics is also given to the readers.

PART -A

PART -B
Integral Calculus: Rectification of standard curves; Areas bounded by standard curves; Volumes and surfaces of revolution of curves;
Multiple Integrals: Double and triple integral and their evaluation, change of order of integration, change of variable, Application of double and triple integration to find areas and volumes. Centre of gravity and Moment of inertia

PART -C
Vector Calculus: Scalar and vector fields, differentiation of vectors, velocity and acceleration.
Vector differential operators: Del, Gradient, Divergence and Curl, their physical interpretations. Line, surface and volume integrals.
Application of Vector Calculus: Flux, Solenoidal and Irrotational vectors. Gauss Divergence theorem. Green's theorem in plane, Stoke's theorem (without proofs) and their applications

PART -D
References:

Course Title: Engineering Physics
Course Code: PHY151B

Total Lecture: 60

Course Objective: The aim of this course on physics is to make the student of engineering understand the basic concepts of physics which will form the basis of certain concept in their respective fields.

PART - A

PHYSICAL OPTICS: (14)
Interference: Division of wave front, Fresnel's biprism, division of amplitude, Newton's rings and applications.
Diffraction: Difference between Fraunhofer and Fresnel diffraction, Fraunhofer diffraction through a slit, plane transmission diffraction grating, its dispersive and resolving power.
Polarization: Polarized and unpolarized light, double refraction, Nicol prism, quarter and half wave plates.

PART - B

LASER: (15)
FIBRE OPTICS: Propagation of light in fibres, numerical aperture, single mode and multimode fibres, applications

PART C

DIELECTRICS: (13)
Molecular Theory, polarization, displacement, susceptibility, dielectric coefficient, permittivity, relations between electric vectors, Gauss’s law in the presence of a dielectric, energy stored in an electric field, Behavior of dielectric in alternating field and clausius-Mossotti equation.

PART - D

QUANTUM MECHANICS: (18)
Difficulties with Classical physics, Introduction to quantum mechanics simple concepts, Black Body radiation, Planck’s Law of radiation and its limitations, Group velocity and phase velocity, Schrodinger’s wave equations and their applications.
NANOPHYSICS: Introduction to Nanoscience and Nanotechnology, Electron confinement, Nanomaterials, Nanoparticles, Quantum structure, CNT, Synthesis of Nanomaterials and Application of Nanomaterials.
SUPER CONDUCTIVITY:
Introduction (experimental survey), Meissner effect, Type I and type II superconductors, London equation, Elements of BCS theory, Applications of superconductors.

Reference Books:
Course Title: Mechanical Engineering Fundamentals
Course Code: MEC103

Course Objectives:
To impart the basic knowledge of thermodynamic principles, design principles, power transmission devices, power producing and power absorbing devices.

**PART -A**

**Fundamental Concepts of Thermodynamics**
Introduction, Thermodynamic System and its types, Boundary and its types, Surroundings, Thermodynamic properties, State, Path, process and cycles, Thermodynamic Equilibrium, Working Substance, Microscopic and Macroscopic Analysis, Units and Dimensions, Quasi Static Process, Reversible and Irreversible processes, Point Function and Path Function, Mechanical and Thermodynamic work, $P$-$dv$ Work (Displacement Work), Work is a Path Function, Equations for work done in various processes.

**Laws of Thermodynamics**

**PART -B**

**Pressure**
Pressure Concept and Definition, Pressure conversion Table, Atmospheric pressure, Standard Atmospheric Pressure, Gauge Pressure, Vacuum Pressure, Absolute pressure, Properties of fluid, Pressure head of a Liquid, Pascal’s Law, Pressure measurement: Mechanical Gauges and Manometers, Mechanical Gauges: (Bourdon tube pressure gauge, Diaphragm pressure gauge, Dead weight), Manometers: (Principle/Advantage/Limitation/Classification), Piezometer, Single U tube manometer (Numerical for Vacuum and Gauge pressure), [Simple problems on above topics]

**Heat Transfer**
Introduction, Heat Transfer vs Thermodynamics, Applications, Thermal Conductivity, Thermal Resistance, Modes of heat transfer, Spectrum of electromagnetic radiation, Surface emission
properties, Absorptivity, Reflectivity and Transmissivity, Fourier law, Newton\'s law of cooling, Stefan Boltzmann\'s Law, Heat Exchangers (Applications, Selection, Classification), Thermal Insulation (Properties of insulation, Types of Insulations, Thermal Insulating Materials)

**Power Absorbing Devices**

Power Absorbing Devices, Difference between Hydraulic pump, Air compressor, Fan, Blower, Pump (Function, Selection, Applications), Classification of Pump, Positive displacement and Dynamic Pumps, Reciprocating Pumps and its types, Rotary Pumps and its types, Centrifugal Pump, Axial Pump

**PART -C**

**Power Producing Devices Boiler**

States of matter, Changing State of Matter, Sublimation, Effect of temperature during change of Phase, Steam boiler, Application, Classification of boilers, Types of boilers (Brief Description), Essentials of a good boiler, Advantages of superheating the steam, Comparison between Water tube and Fire tube boilers, Function of boiler Mountings and Accessories

**Turbines**

Turbine, Classification based on working fluid, Classification of hydraulic turbines, Selection of hydraulic turbines, Impulse Turbines (Pelton Wheel/ Turgo/ Cross Flow), Reaction Turbines (Francis/ Kaplan/ Propeller)

**Internal Combustion Engines**

Heat Engine, Types of Heat Engine, Advantages, Disadvantages and Applications, Classification of IC Engine, Engine Components (Location, Function and Material), Basic Terminology used in IC engine, Four stroke Cycle Engines (SI and CI), Two stroke Cycle Engines (SI and CI)

**PART -D**

**Principles of Design**

Need of design, Product Life Cycle, Material properties and selection, Factors affecting material selection, Stress and Strain and its types, Hooke\'s law, Modulus of Elasticity, Longitudinal and Lateral Strain, Poisson\'s ratio, Stress- Strain Curve for ductile material and brittle material, Factor of Safety, Centre of Gravity, Centroid, Centroid of areas of plain, Figures (Without Derivation), Centroid of areas of composite sections (Without Derivation), Moment of Inertia, Radius of gyration, Theorem of perpendicular axis, Theorem of parallel axis, MI of L, I and T sections, [Simple problems on above topics]
Power Transmission Devices and Machine Elements

Individual and group drive system (advantages and Disadvantages), Belt drive (Types: V and Flat Belts and their Applications, Advantages and Disadvantages), Ropes drive (Types: Fiber and Wire Ropes and their Applications, Advantages and Disadvantages), Chain drive (Applications, advantages and Disadvantages, Sprockets), Gear drive (Types of Gears), Power transmission shafts, Types of shafts, Application of shafts, Axle, Keys (Function, Classification), Coupling (Function, Classification: Rigid and Flexible), Flanged coupling, Oldham’s coupling, Universal coupling, Bearings and their types, Flywheel construction and types

References:

5. Kumar Parveen, Basic Mechanical Engineering, New Delhi: Pearson Education
Course Title: Electrical and Electronics Technology
Course Code: ELE105

PART -A

D.C Circuit Analysis:
Voltage source, current source, dependent and independent sources, analysis of D.C circuit by KCL and KVL, Nodal and Mesh analysis, Thevenin theorem, Norton theorem, superposition theorem, Maximum Power Transfer Theorem

PART B

A.C Circuit Analysis:
Review of single phase A.C. circuit under sinusoidal steady state, solution of R.L.C. Series circuit, the j operator, complex representation of impedance, solution of series and parallel circuit, series and parallel resonance, 3 phase A.C. Circuit, star and delta connections, line and phase quantities solution of 3 phase circuits, balance supply voltage and balanced supply voltage and balance load, phasor diagram, measurement of power and power factor by two wattmeter method.

PART -C

Magnetic Circuit:

Transformers:
Single phase transformer, basic concepts constructional detail, type, voltage current and impedance Transformation, phasor diagram, equivalent circuit, voltage regulation, oc/sc test, losses and efficiency concept of All day efficiency, autotransformer.

PART D

Rotating Electrical Machines:
Basic concepts, working principle and general construction of DC machines (motor/generators), torque and EMF expression

Basic Electronics:
P-Type and N-Type semiconductor, concept of diode, transistor and their application, introduction to OPAMP, application of op amp as a subtractor, summer, differentiator, integrator, logic gates AND, OR, NOT, NOR, NAND etc.
References:


DAV UNIVERSITY, JALANDHAR

Course Title: Human Values and General Studies
Course Code: SGS107B

Course Objectives

a) To sensitize students about the role and importance of human values and ethics in personal, social and professional life.

b) To enable students to understand and appreciate ethical concerns relevant to modern lives.

c) To prepare a foundation for appearing in various competitive examinations

d) To sensitize the students about the current issues and events of national and international importance

e) To provide opportunity to the students to study inter disciplinary subjects like Geography, Science, Economy, Polity, History, International Relations etc.

PART -A

**Human Values**

1. **Concept of Human Values**: Meaning, Types and Importance of Values.

2. **Value Education**: Basic guidelines for value education

3. **Value crisis and its redressal**

**Being Good and Responsible**

1. Self Exploration and Self Evaluation

2. Acquiring Core Values for Self Development

3. Living in Harmony with Self, Family and Society

4. Values enshrined in the Constitution: Liberty, Equality

5. Fraternity and Fundamental Duties.

PART -B

**Value – based living**

1. Vedic values of life

2. *Karma Yoga* and *Jnana Yoga*

3. *AshtaMarga* and *Tri-Ratna*

**Ethical Living:**

1. Personal Ethics

2. Professional Ethics

3. Ethics in Education
General Geography

World Geography

Indian Geography
Location, Area and Dimensions, Physical Presence, Indian States and Union Territories, Important sites and Monuments, Largest-Longest and Highest in India.

General History
Glimpses of India History, Ancient Indian, Medieval India, Modern India, Various Phases of Indian National Movement, Prominent Personalities, Glimpses of Punjab history with special reference to period of Sikh Gurus

Glimpses of World History
Important Events of World History, Revolutions and Wars of Independence, Political Philosophies like Nazism, Fascism, Communism, Capitalism, Liberalism etc.

Indian Polity: Constitution of India

General Economy

General Science
General appreciation and understandings of science including the matters of everyday observation and experience, Inventions and Discoveries

Sports and Recreation
The World of Sports and recreation, Who’s Who is sports, Major Events, Awards and Honours. Famous personalities, Festivals, Arts and Artists

Current Affairs
National and International Issues and Events in News, Governments Schemes and Policy Decisions
DAV UNIVERSITY, JALANDHAR

Miscellaneous Information

Who is who

Books and Authors, Persons in News, Awards and Honours, Abbreviations and Sports

References:

3. Human Values and Professional Ethics, RishabhAnand, SatyaPrakashan, New Delhi, 2012
16. Advance Objective General Knowledge, R. S. Aggarwal, S. Chand Publisher (2013)

CURRENT AFFAIRS

Magazines
Economic and Political Weekly, Yojna, the Week, India Today, Frontline, Spectrum.
Competition Success Review, Competition Master, Civil Services Chronicle, Current Affairs, World Atlas Book

Newspapers
The Hindu, Times of India, The Hindustan Times, The Tribune
DAV UNIVERSITY, JALANDHAR

Course Title: Manufacturing Practice
Course Code: MEC104

Course Objective:

1. Know basic workshop processes, Read and interpret job drawing.
2. Identify, select and use various marking, measuring, holding, striking and cutting tools & equipment’s
3. Operate and control different machines and equipment’s.

CARPENTRY SHOP

a) Preparation of half lap joint
b) Preparation of Mortise and Tenon Joint
c) Preparation of a Dove & Tail joint
d) To prepare a White board duster

Welding Shop:

a) Preparation of Joint by Arc Welding
b) Preparation of Joint by using Gas Welding
c) Preparation of Joint by MIG/ TIG Welding
d) Preparation of Joint by Spot/ Seam Welding

Smithy Shop

a) To Forge the L – Hook
b) To Forge a Chisel
c) To Forge a Cube from a M.S Round
d) To forge a screw driver

Fitting Shop

a) Filing a dimensioned rectangular or square piece and prepare a sq. fitting
b) Preparation of T fitting male part
c) Preparation of U fitting Female part
d) Internal thread Cutting in Square piece and external thread cutting on a rod and assembling as a paper weight

Foundry Shop:

a) To make a Mould of solid pattern
b) To prepare a mould of sleeve fitting using gating system
c) To make a Mould of Split Pattern using Cope & Drag
References:

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:
- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

1. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
2. To determine the Dispersive Power and resolving power of the Material of a given Prism using Mercury Light.
3. To determine wavelength of sodium light using Fresnel Biprism.
4. To determine wavelength of sodium light using Newton’s Rings.
5. To determination Wavelength of Sodium Light using Michelson’s Interferometer.
6. To determine the wavelength of Laser light using Diffraction of Single Slit.
7. To determine the wavelength of (1) Sodium and (2) Mercury Light using Plane Diffraction Grating.
8. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.
9. To study the wavelength of spectral lines of sodium light using plane transmission grating.
10. To study the specific rotation of sugar solution Laurent’s half shade polarimeter method.
11. To compare the focal length of two lenses by Nodal slide method.
12. To find the unknown low resistance by Carey Foster bridge.
13. To determine the beam divergence of the HeNe laser.
14. To study the Meissner’s effect in superconducting sample.
15. To study the Faraday law of electromagnetic induction.
16. To study the capacitance by flashing/quenching of Neon bulb kit
17. To compare the two unknown capacitances of two capacitors by using DeSauty’s bridge.
18. To find out the unknown inductance by using the Anderson’s bridge method.
19. To study the numerical aperture and propagation losses for He-Ne laser by using the optical fibre set up for
20. To study the Planck’s constant by using photoelectric cell method.
Course Title: Electrical and Electronics Technology Lab

Course Code: ELE106

Course Objective: This course provides a practical aspect of Circuit Analysis using Ohm's law, Kirchhoff's laws and network theorems, to understand the constructional detail of Electrical machines

List of Experiments

2. To verify Thevenin’s and Norton’s theorems.
3. To verify Superposition theorem.
4. To verify Maximum Power Transfer theorem.
5. To study frequency response of a series R-L-C circuit and determine resonant frequency and Q-factor for various values of R, L and C.
6. To study frequency response of a parallel R-L-C circuit and determine resonant frequency and Q-factor for various values of R, L and C.
7. To perform direct load test of a transformer and plot efficiency versus load characteristics.
8. To perform open circuit and short circuit test on transformer.
9. To perform speed control of DC motor.
10. Measurement of power in a three phase system by two wattmeter method.
11. To plot the V-I characteristics of PN-junction diode.
12. To verify the truth table of logic gates.
14. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor)
Course Title: Swachh Bharat Summer Internships

Course Code: XXX

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Swachh Bharat Summer internship of duration 100 hours in the period of 1st May to 31st July. In this internship student will enrol for promoting swachhta in nearby villages of the institute. Student will select the village of their choice and work with the village community for building lasting system for improving the overall sanitation and hygiene in village.
Course Objective:
The objective of the course is to enable the students to understand the basic concepts related to Laplace transforms, Fourier series, ordinary differential and partial differential equations and their applications.

PART-A

Laplace Transforms
Laplace transforms of various standard functions, Linear property of Laplace transforms, Shifting property and change of scale, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations. [14]

PART-B

Fourier series

PART-C

Partial Differential Equations
Formulation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients. Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation and their applications, solution by the method of separation of variables. [14]

PART-D

Functions of Complex Variable
Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, and harmonic functions.

Conformal Mapping
Definition, standard transformations, translation, rotation, inversion, bilinear.
Complex Integration
Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions (without proofs), singular points, poles, residue, Integration of function of complex variables using the method of residues.

REFERENCES:

Course Title: Introduction to Civil Engineering

Course Code: BCE 201

Course Objectives: When the students enter the college to pursue a degree in Civil Engineering they need to understand the breadth and depth available in this field for possible engagement. This course is designed to address the following:

• To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering
• To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness.
• To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.

Part A
Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career. History of Civil engineering Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers

Part B
Overview of National Planning for Construction and Infrastructure Development Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructure works; Fundamentals of Architecture & Town Planning Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities
Fundamentals of Building Materials Stones, bricks, mortars, Plain,

Part C
Basics of Construction Management & Contracts Management Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems;
Advent of Lean Construction; Importance of Contracts Management Environmental Engineering & Sustainability Water treatment systems; Effluent treatment systems; various types of foundations; basics of rock mechanics & tunnelling

Part D

Power Plant Structures Chimneys, Natural & Induced Draught Colling towers, coal handling systems, ash handling systems; nuclear containment structures; hydro power projects

Structural Engineering Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Transportation Engineering Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; PPP in transport sector; Intelligent Transport Systems; Urban Public and Freight Transportation; Road Safety under heterogeneous traffic; Sustainable and resilient pavement materials, design, construction and management; Case studies and examples. Repairs & Rehabilitation of Structures: Basics of corrosion phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures;

Text/Reference Books:

Course Title: SURVEYING AND GEOMATICS

Paper Code: BCE 203

Course Objective: With the successful completion of the course, the student should have the capability to:

- have a good understanding of the various surveying techniques.
- Effectively communicate with team members during field activities; identify appropriate safety procedures for personal protection; properly handle and use measurement instruments.

Learning Outcomes: The course will enable the students to:

- Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities.
- Translate the knowledge gained for the implementation of Civil infrastructure facilities.
- Relate the knowledge on Surveying to the new frontiers of science like Hydrographic surveying, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing.

Part-A

Introduction to Surveying: Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, traversing with compass

Plane table surveying methods of plane table survey, two and three point problems, Lehmann's Rules, errors.

Part-B

Leveling: Principles of leveling- booking and reducing levels; differential, reciprocal leveling, profile leveling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes.

Curves: Elements of simple and compound curves – Method of setting out– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve - Vertical curves

Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories – Advantages and Applications Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

Part-D

Photogrammetry Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplotting instruments.

Remote Sensing: Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

REFERENCE:

3. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
Course Title: INTRODUCTION TO FLUID MECHANICS

Paper Code: BCE 205A

Course Objective: This course offers a good understanding of the various properties of fluid like dynamic and kinematic properties.

Learning Outcomes: After the completion of this course the participants would gain the knowledge about various types of flow, fluid properties like Fluid Kinematics and fluid dynamics.

Part-A

Fluid and their properties: Concept of fluid, difference between solids, liquids and gases; ideal and real fluids; Continuum concept of fluid: density, specific weight and relative density; viscosity and its dependence on temperature; surface tension and capillarity, vapor pressure and cavitation’s, compressibility and bulk modulus; Newtonian and non-Newtonian fluids

Fluid Statics: Concept of pressure, Pascal’s law and its engineering hydrostatic paradox. Action of fluid pressure on plane (horizontal, vertical and inclined) submerged surface, resultant force and centre of pressure, force on a curved surface due to hydrostatic pressure. Buoyancy and flotation, stability of floating and submerged bodies, Meta centric height and its determination.

Part-B

Fluid Kinematics: Classification of fluid flows, velocity and acceleration of fluid particle, local and convective acceleration, normal & tangential acceleration streamline, pathline and streakline, flow rate and discharge mean velocity continuity equation in Cartesian co-ordinates. Rotational flows - Rotational velocity and circulation, stream & velocity potential function

Part-C

Fluid Dynamics: Euler’s equation, Bernoulli’s equation and steady flow energy equation; representation of energy changes in fluid system, impulse momentum equation, kinetic energy and momentum correction factors, flow along a curved streamline, free and forced vortex motion

Part-D

Dimensional Analysis and Similitude: Fundamental and derived units and dimensions, dimensional homogeneity, Rayleigh’s and Buckingham’s Pi method for dimensional analysis,
dimension less number and their significance, geometric, kinematic and dynamic similarity, model studies.

**Flow Past immersed bodies:** Drag and lift deformation Drag and pressure drag. Drag on asphere, cylinder and Air foil: lift-Magnus Effect and circulation lift on a circular cylinder.

**Flow Measurement:** - Manometers, Pitot tubes, venture meter and orifice meters, orifices, mouthpieces, notches (Rectangular and V-notch) and weirs (Sharp crested Weirs).

**REFERENCES:**
DAV UNIVERSITY, JALANDHAR

Course Title: ENVIRONMENT ENGINEERING-1

Paper Code: BCE 207

Course Objective: - To understand the basic environmental pollutants

Learning Outcomes: - Students will be able to identify and value the effect of the pollutants on the environment:

Part A

Water: - Sources of water, beneficial uses of water, Water demand, water quality standards, water safety plans, water Supply systems, need for planned water supply schemes, components of water supply system, Distribution system, various valves used in W/S systems, water treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, plumbing fixtures, Government authorities and their roles in water supply

Part B

Sewage: - Introduction to wastewater Engineering, basic terms related to sewerage systems, estimation of sewage flow, storm water, conveyance of sewage, different materials used for conveyance of sewage, Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems, Efficient sewage disposal, Sludge Treatment, National River cleaning plans, basic sewage treatment, general effluent discharge standards.

Part C

Air: - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution - Occupational hazards, Urban air pollution automobile pollution, Air quality standards, Control measures for Air pollution, construction and limitations

Noise: - Introduction to noise pollution, measurement and various control methods, Noise pollution standards

Part D

Solid waste Management: - Introduction to solid waste, different types of solid waste, basic terminologies, Characteristics of solid waste, management: Segregation, collection, transportation and disposal of solid waste, Municipal solid waste, Composition and various chemical and physical parameters of MSW, 3 R's of solid waste management. Solid waste norms in India, Hazardous waste management
REFERENCES:

2. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey
5. Publication
Course Title: ENGINEERING GEOLOGY

Paper Code: BCE 209

Course Objective: This course offers a good understanding and study of different materials and material properties in civil engineering.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of various materials used in construction, their properties, uses and type of construction work for which they can be used.

Part-A

Building Stones: General, Uses of stones, natural bed of stones, qualities of a good buildingstone, deterioration of stones, preservation of stones, artificial stones, common building stones of India and their uses.

Bricks: General, Composition of good brick earth, Harmful ingredients in brick earth, qualities of good bricks, tests for bricks, classification of bricks.

Timber: Definition, classification of trees, structure of a tree, felling of trees, seasoning of timber, storage of timber, market forms of timber.

Part-B

Lime: General, some definitions calcination, Hydraulicity, setting, slacking, sources of lime, classification of limes, uses of lime, tests for limestones.

Cement: Constituents of Cement, Manufacture of Portland cement

Concrete: Introduction, Constituents of concrete, Batching of materials, Manufacturing process of cement concrete, workability and factors affecting it, Methods to determine workability, segregation and bleeding of concrete, Strength of concrete and factors affecting it.

Miscellaneous materials: Paints, Distempering, Glass, Plastics

Part-C

Foundation and Walls: Definition, types of foundations, Types of walls and thickness considerations.

Brick and stone masonry: Terms used, Types of bonds & their merits and demerits, rubble and ashlar joints in stone masonry, cement concrete hollow blocks and their advantages and disadvantage.
Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

Part-D

Roofs: Terms used, Classification of roofs and roof trusses, Different roof covering material

Plastering and pointing: Objects, Methods of plastering, Materials and types, Defects in plastering, special material for plastered surface, Distempering white washing and colour washing.

Floors: General, Types of floors used in building & and their suitability, factors for selecting suitable floor for building.

REFERENCE:
3. Shetty MS, “Concrete Technology” S. Chand & Co. N. Delhi, 2005
Course Title: ENGINEERING MECHANICS

Paper Code: BCE 211

Course Objective: The objective of this Course is to provide an introductory treatment of Engineering Mechanics to all the students of engineering, with a view to prepare a good foundation for taking up advanced courses in the area in the subsequent semesters.

Learning Outcomes: After the completion of this course the participants would confidently tackle equilibrium equations, moments and inertia problems, Master calculator/computing basic skills to use to advantage in solving mechanics problems and Gain a firm foundation in engineering Mechanics for furthering the career in Engineering.

Part-A
Introduction to Engineering Mechanics covering, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

Part-B
Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; moment of inertia- Definition, Moment of inertia of plane sections from first principlesMoment of inertia of standard sections and compositessections

Part-C
Mechanical Vibrations covering, Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums

Part-D
Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous center of rotation in plane motion and simple problems; D'Alembert’s principle and its applications in plane motion and connected bodies; Work energy
principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation

REFERENCES
6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education
Course Title: Surveying Lab
Paper Code: BCE 213

List of experiments:
1. Setting up of survey lines between survey stations, their measurements and ranging.
3. Levelling Exercises, height of instrument and rise & fall methods.
5. Determination of tachometric constants and determination of reduced levels by tacheometric observations.
7. Two point & three point problem.
8. Determination of height of an inaccessible object with tacheometer.
9. Setting out a transition curve in the field.
10. Surveying with Total Station (Detailed layout of a Traverse).
Course Title: FLUID MECHANICS Lab

Paper Code: BCE 215

### List of experiments:

1. To determine the meta-centric height of a floating vessel under loaded and unloaded conditions.
2. To study the flow through a variable area duct and verify Bernoulli's energy equation.
3. To determine the coefficient of discharge for an obstruction flow meter (venturimeter).
4. To determine the discharge coefficient for a Vee notch or rectangular notch.
5. To determine the hydraulic coefficients for flow through an orifice.
6. To determine the friction coefficient for pipes of different diameter.
7. To determine the head loss in a pipe line due to sudden expansion / sudden contraction/ bend.
8. To determine the velocity distribution for pipe line flow with a pitot static probe.

### REFERENCE:

List of experiments:
1. Study of Physical properties of minerals
2. Identification of rocks forming silicate and ore minerals
3. Recognition of rocks
4. Use of clinometers compass and Burton compass for measurement dip and strike of formations
5. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.,
6. Simple structural geology problems
7. Study of models of geological structures and out crops patterns of different types of rocks and land forms
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FOURTH SEMESTER

Course Title: Civil Engineering-Societal and Global Impact

Course Code: BCE 202

Course Objective:

- Awareness of the importance of Civil Engineering and the impact it has on the Society and at global levels
- Awareness of the impact of Civil Engineering for the various specific fields of human endeavour.
- Need to think innovatively to ensure Sustainability

Part A
Understanding the past to look into the future: Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution; Recent major Civil Engineering breakthroughs and innovations; Present day world and future projections Human Development Index and Ecological Footprint of India Vs other countries and analysis; Understanding the importance of Civil Engineering in shaping and impacting the world; The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering

Part B
Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability; Sustainability measures; Innovations and methodologies for ensuring Sustainability.

Part C
Built environment – Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Security systems; Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures; Innovations and methodologies for ensuring Sustainability

Part D
Civil Engineering Projects – Environmental Impact Analysis procedures; Waste (materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction Techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment (projects, facilities management), Quality of products, Health & Safety aspects for stakeholders; Innovations and methodologies for ensuring Sustainability during Project development;

**Text/Reference Books:**

Course Title: HYDRAULICS ENGINEERING

Paper Code: BCE 204

Course Objective: To familiarize the students with different types of flows, channels and their properties in fluid flow.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of open channel flow and to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.

Part-A

Laminar Flow: Navier-stokes equations in Cartesian coordinates (no derivation), meaning of terms, Flow through circular section pipe, flow between parallel plates, stokes law. Transition from laminar to turbulent, Stoke’s law, Measurement of viscosity.


Part-B

Boundary Layer Analysis: Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

Part-C

Uniform flow in open Channels: Flow classifications, basic resistance Equation for open channel flow. Chezy’s, Manning’s, Bazin’s and Kutter’s formulae. Variation of roughness coefficient, conveyance and normal depth. Velocity Distribution. Most efficient flow sections; rectangular, trapezoidal and circular.

with examples, computation of water surface profile by graphical, numerical and analytical approaches. [8]

**Part-D**

**Hydraulic Jump and Surges:** Theory of Jump, Elements of jump in a rectangular Channel, length and height of jump, location of jump, Energy dissipation and other uses, Positive and negative surges [6]

**Flow through Pipes:** Loss of head through pipes, Darcy-Wiesbatch equation, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles. Water hammer in pipes and control measures. [6]

**REFERENCES:**


Course Title: INTRODUCTION TO SOLID MECHANICS

Paper Code: BCE 206

Course Objective: The objective of this Course is to introduce to continuum mechanics and material modelling of engineering materials based on first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds.

Learning Outcomes: On completion of the course, the student will be able to describe the concepts and principles understand the theory of elasticity including strain/displacement and Hooke’s law relationships; and perform calculations, relative to the strength and stability of structures and mechanical components. Also student would gain the knowledge to calculate the deflection at any point on a beam subjected to a combination of loads; solve for stresses and deflections of beams under unsymmetrical loading.

Part-A


Part-B

Compound Stresses and Strains- Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.

Part-C

Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams. BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Part-D
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**Flexural Stresses**- Theory of simple bending – Assumptions – Derivation of bending equation: \( M/I = f/y = E/R \) - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method and Conjugate Beam. Use of these methods to calculate slope and deflection for determinant beams.

**Torsion**- Derivation of torsion equation and its assumptions.

**REFERENCES**

Course Title: DISASTER PREPAREDNESS AND PLANNING

Paper Code: BCE 208

Course Objective: This course should provide the students with good understanding in various disaster managing steps.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of disaster reduction and various direct and indirect damages due to disaster

Part-A

Introduction - Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation). Disasters- Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Part-B

Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters

Part-C

Disaster Risk Reduction (DRR)- Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Part-D

Disaster Management Environment and Development- Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.
REFERENCE:


Course Title: Engineering Material and Construction

Paper Code: BCE 210

Course Course Objective: This course offers a good understanding and study of different materials and material properties in civil engineering.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of various materials used in construction, their properties, uses and type of construction work for which they can be used.

Part-A

Building Stones: General, Uses of stones, natural bed of stones, qualities of a good building stone, deterioration of stones, preservation of stones, artificial stones, common building stones of India and their uses

Bricks: General, Composition of good brick earth, Harmful ingredients in brick earth, qualities of good bricks, tests for bricks, classification of bricks.

Timber: Definition, classification of trees, structure of a tree, felling of trees, seasoning of timber, storage of timber, market forms of timber.

Part-B

Lime: General, some definitions calcination, Hydraulicity, setting, slacking, sources of lime, classification of limes, uses of lime, tests for limestones.

Cement: Constituents of Cement, Manufacture of Portland cement


Part-C

Foundation and Walls: Definition, types of foundations, Types of walls and thickness considerations.
Brick and stone masonry: Terms used, Types of bonds & their merits and demerits, rubble and ashlars joints in stone masonry, cement concrete hollow blocks and their advantages and disadvantage.

Lintels and Arches: Definition, function and classification of lintels, Balconies, chejja and canopy. Arches; Elements and Stability of an Arch.

Part-D

Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

Roofs & Floors: Terms used, Classification of roofs and roof trusses, Different roof covering material. General, Types of floors used in building & and their suitability, factors for selecting suitable floor for building.

Plastering and pointing: Objects, Methods of plastering, Materials and types, Defects in plastering, special material for plastered surface, Distempering white washing and colour washing.

REFERENCE:

3. ShettyMS, “Concrete Technology” S. Chand & Co. N. Delhi, 2005
7. Materials for Civil and Construction Engineers by Michael S. Mamlouk, John P. Zaniewski
Course Title: MATERIALS, TESTING AND EVALUATION

Paper Code: BCE 212

Course Objective: The objective of this Course is to deal with an experimental determination and evaluation of mechanical characteristics and advanced behavior of metallic and non-metallic structural materials. The course deals with explanation of deformation and fracture behavior of Structural materials.

Learning Outcomes: On completion of the course, the student will be Learn

- Different materials used in civil engineering applications
- Planning an experimental program, selecting the test configuration, selecting the testspecimens and collecting raw data
- Documenting the experimental program including the test procedures, collected data, method of interpretation and final results

Part-A

Introduction to Engineering Materials covering, Cements, M-Sand, Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete) Ceramics, and Refractories, Bitumen and asphaltic materials, Acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses of these.


Part-B

Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material (brittle, quasi-brittle, elastic and so on) True stress – strain interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep – fundamentals and characteristics; Brittle fracture of steel – temperature transition approach; Background of fracture mechanics; discussion of fracture toughness testing.
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Part-C
Laboratory for mechanical testing: Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture mechanics – background; Fracture toughness – different materials; Fatigue of material; Creep.

Part-D

REFERENCES
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications
7. Related papers published in international journals
Course Title: MATERIAL TESTING LABORATORY

Paper Code: BCE 214

List of Experiments

1. Gradation of coarse and fine aggregates
2. Compressive strength test on aggregates
3. Elastic Behavior of metals & materials
4. Concrete - Early Age Properties
5. Compression – Directionality
6. Soil Classification
7. Consolidation and Strength Tests
8. Torsion test
9. Hardness tests (Brinnel's and Rockwell)
10. Tests on closely coiled and open coiled springs
Course Title: SOLID MECHANICS LABORATORY

Paper Code: BCE 216

List of experiments:

1. Draw Stress Strain curve for Ductile and Brittle material in tension.
2. Draw Stress Strain curve for Ductile and Brittle material in compression.
3. Draw shear stress, shear strain curve for ductile and brittle material in torsion strength testing
4. Draw load deflection curve for spring in loading and unloading conditions.
5. To determine the fatigue strength of the material.
6. To determine the impact strength by Izod and Charpy test.
7. To test a mild steel and cast iron specimen in double shear.
8. Measurement of deflections in statically determinate beam
Course Title: HYDRAULICS ENGINEERING-II LAB

Paper Code: BCE 218

List of Experiments:
1. Verification of Stoke's Law
2. To determine the type of flow from Reynold’s Apparatus
3. Boundary layer development on a flat plate
4. Determination of drag on a body in a wind tunnel.
5. Determination of manning’s coefficients of Rugosity.
7. Discharge and flow profile over a Broad crested weir.

REFERENCE:
Experimental Fluid Mechanics: G.L.Asawa
Open Channel Hydraulics: V.T.Chow
Course Title: GEOTECHNICAL ENGINEERING

Paper Code: BCE 301

Course Objective:
- To familiarize the students with concept of soil and its index properties.
- To know about how engineering properties like permeability, shear strength etc and compaction characteristics affects soil structure.

Learning Outcomes: After the completion of this course the student must be able to:
- Understand the different types of soil based on their formation mechanism
- Classify any soils based on their particle size distribution and index properties
- Determine the compactive effort required to obtain necessary degree of compaction in-situ.
- Evaluate the stiffness of soil using shear strength parameters

Part-A

Introduction: Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering. Scope of soil engineering. Comparison and difference between soil and rock. Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity, etc. Relationship between volume& weight, voids ratio- moisture content, unit weight- percent air voids, saturation- moisture content, moisture content- specific gravity etc. Determination of various parameters such as: Moisture content by oven dry method, pycnometer, sand bath method, torsional balance method, alcohol method and sensors. Specific gravity by density bottlemethod, pycnometer method, measuring flask method. Unit weight by water displacement method, submerged weight method, core-cutter method, sand-replacement method.

soil classification: particle size classification, textural classification, unified soil classification system, Indian standard soil classification system. Identification: field identification of soils, general characteristics of soil in different groups. [4]

**Part-B**

**Effective Stress Principle:** **Introduction,** effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition. [4]

Compaction of Soil: Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control. [4]

**Part-C**
Consolidation of Soil: Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi’s theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation. [8]

**Part-D**
**Shear Strength:** Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters, unconfined compression test, vane shear test. [6]

**Stability of Slopes:** Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts. [6]

**REFERENCE:**
Course Objective: To understand the basic aquifer parameters and estimate groundwater resources for different hydro-geological boundary conditions.

Learning Outcomes: To understand the interaction among various processes in the hydrologic cycle

Part A

Introduction- hydrologic cycle, water-budget equation, water balance, need of hydrology in engineering, Different forms of precipitation, precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth area- duration relationships, maximum intensity/depth-duration-frequency relationship

Abstractions from precipitation- evaporation process, evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration and its measurement, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity.

Part B

Runoff- runoff volume, estimation of runoff volume, flow duration curve, flow-mass curve, hydrographs, unit hydrograph, surface and ground water resources of India

Ground water and well hydrology- forms of subsurface water, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers.

Part C

Water withdrawals and uses- Different uses of water: agriculture, hydroelectric generation; flood control. Analysis of surface water supply, Water requirement of Crops, crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

Part D

Canals and Dams - canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Kennedy’s and Lacey’s theory of regime channels. Canal outlets, Water logging: causes, effects and remedial measures. Lining of canals, types of lining. Drainage of irrigated lands: necessity, methods,
different types of dams, forces acting on dam, different type of dam failures, selection of suitable dam sites.

**Text/Reference Books:**

5. J D Zimmerman, Irrigation, John Wiley & Sons
7. S k Garg Hydrology and water resource Engineering
Course Title: MECHANICS OF MATERIALS

Paper Code: BCE 305

Course Objective: The objective of this Course is to introduce to continuum mechanics and material modeling of engineering materials based on first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design.

Learning Outcomes: On completion of the course, the student will be

- Understand the deformation and strains under different load action and response in terms of forces and moments
- Understand the behaviour under different loading actions

Part-A
Deformation and Strain covering description of finite deformation, Infinitesimal deformation; Analysis of statically determinate trusses; Stability of dams, retaining walls and chimneys; Stress analysis of thin, thick and compound cylinder, Forces and Moments Transmitted by Slender Members, Shear Force and Bending Moment Diagrams, Momentum Balance, Stress States / Failure Criterion

Part-B
Force-deformation Relationships and Static Indeterminacy, Uniaxial Loading and Material Properties, Trusses and Their Deformations, Statically Determinate and Indeterminate trusses, Multiaxial Stress and Strain, Multiaxial Strain and Multiaxial Stress-strain Relationships

Part-C
Pure Bending, Moment-curvature Relationship, Beam Deflection, Symmetry, Superposition, and Statically Indeterminate Beams, Shear and Torsion, Torsion and Twisting, Thermoelasticity, energy methods, Strain energy, elastic, complementary and total strain energy, Strain energy of axially loaded bar, Beam in bending, shear and torsion; General energy theorems, Castigliano’s theorem, Maxwell Bettie’s reciprocal theorem; Virtual work and unit load method for deflection, Application to problems of beams and frames.

Part-D
Stability of columns, Euler's formula, end conditions and effective length factor, Columns with eccentric and lateral load; Plasticity and Yield Design covering 1D-Plasticity – An Energy Approach, Plasticity Models, Limit Analysis and Yield Design

REFERENCES
Course Title: ENGINEERING ECONOMICS, ESTIMATION & COSTING

Paper Code: BCE 307

Course Objective: This course should provide the students with good understanding of various types of quantity and quality analysis of civil engineering projects.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of calculation of materials required for different projects.

Part-A


Part-B

Estimates: Types, complete set of estimate, working drawings, site plan, layout plan, index plan, plinth area administrative approval and Technical Sanction.

1. Estimate of buildings
2. Estimate of R. C.C. works
3. Estimate of sloped roof and steel structures
4. Estimate of water supply and sanitary works
5. Estimates of roads (a) Earthwork (b) Bridges and culverts c) Pavement
6. Estimate of Irrigation works.

Part-C

Analysis of Rates: For earthwork, concrete works, D. P. C., Brickwork, stone masonry, plastering, pointing, road work, carriage of materials.

Specifications- For different classes of building and Civil engineering works
Contracts: Types of contracts, tender, tender notice, tender form, submission and opening of tender, earnest money, security money, measurement book, muster roll, piecework agreement and work order.

Accounts: Division of accounts, cash, receipts of money, cashbook, temporary advance, imprest and accounting procedure.

Arbitration: Arbitration, arbitrator, and arbitration act, powers of arbitrator, arbitration awards.

REFERENCES:
Course Title: DESIGN OF CONCRETE STRUCTURE-I

Paper Code: BCE 309

Course Objective: Aim of this paper is to familiarize the students with Concrete technology and design of various concrete elements like beams, columns etc.

Learning Outcomes: After the completion of this course the participants would gain the knowledge for design of various concrete elements like beams and columns

Note: Use of IS-456-2000 is allowed in the examination.

Part-A

Introduction to Limit State Design Method- Introduction to Working Stress Method and Limit State Method, Characteristic values, characteristic strength, characteristic loads, design values for materials and loads, factored loads, Determination of Neutral Axis Depth and Computation of Moment of Resistance for both singly and doubly reinforced sections.

Part-B

Limit State of Collapse (Shear, bond and torsion) Introduction Design for shear, structural components subjected to torsion, design of rectangular beam section for torsion, development length.

Limit State of Serviceability Deflection, effective span to effective depth ratio, modification factors for singly reinforced, doubly reinforcement and flanged beams, crack formation and its control.

Part-C

Analysis and design of singly reinforced, doubly reinforced beams and flanged beams. Types of failures and assumptions. Reinforced Concrete Slabs: One way and Two way slabs.

Part-D

Compression Members: Definitions, Classifications, Guidelines and Assumptions, Design of Short Axially Loaded Compression Members, Design of Short Compression Members under Axial Load with Uniaxial and biaxial Bending, Preparation of Design Charts, Design of Slender Columns

REFERENCES:
2. S.S Bhavakatti Desgin of concrete structures, New Age International publishers,
Course Title: TRANSPORTATION ENGINEERING

Paper Code: BCE 311

Course Objective: Aim of this paper is to familiarize the students with highway planning and its maintenance.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of highway geometric design and various materials used in highway construction

Part-A

Introduction: Importance and role of transportation systems; different modes of transportation, historical development of road construction, Highway Economics.

Highway Planning & Project Preparation: Planning surveys, Highway alignment, Highway Location surveys, soil and material surveys, Highway Projects: drawing and report.

Part-B


Part-C

Highway materials and construction: Desirable properties of soil, Road aggregates, bitumen, cement & cement concrete as highway materials. Various types of roads & their construction-earth roads, gravel roads, W.B.M., bituminous roads and quality control during construction

Highway Drainage and Maintenance: Importance of drainage and maintenance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas, Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures, Introduction to soil stabilization

Part-D

Pavement Design: Design of flexible and rigid Pavements. Elementary Traffic Engineering-Traffic Engineering studies (speed, volume, O & D, parking and accident studies), traffic signs, traffic signals, road markings, road intersection, highway lighting

REFERENCES:


Course Title: GEOTECHNICAL ENGINEERING LAB

1. Determination of natural moisture content of soil using oven drying method.
2. Determination of specific gravity of soil solids by pycnometer method.
3. Determination of in-situ density by core cutter method and sand replacement method.
4. Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).
5. Determination of Atterberg’s limits.
6. Compaction test of different soils.
7. Determination of coefficient of permeability of soil using Constant-head and Falling-head method.
8. Unconfined Compression Strength Test for fine grained soil.
9. Direct Shear Test.
10. Triaxial compression shear test (UU).
11. Relative density test.

Books Recommended:-

List of Experiments

1. To determine the impact value of aggregates.
2. To determine the crushing value of aggregates.
3. To determine the abrasion value of aggregates by Los Angeles test.
4. To determine flakiness and elongation index of aggregates (shape test).
5. To determine the water absorption and specific gravity of coarse aggregates.
6. To determine grade of bitumen by penetration test.
7. To determine the ability of bitumen to stretch by ductility test.
8. To determine flash and fire point of bitumen.
9. To determine softening point of bitumen by ring and ball apparatus.
10. To determine the bitumen content in a road sample by bitumen extraction test.
11. To determine marshal stability of bituminous mixture.
12. To determine the strength of subgrade soil by CBR Test.

Reference:

1. Highway material and pavement testing by Khanna & Justo
2. Laboratory manual in Highway Engineering by Ajay K Duggal
Course Title: ESTIMATION AND COSTING LABORATORY

Paper Code: BCE 317

List of Experiments

1. Estimation of building (long wall and short wall method)
2. Estimation of building (center line method)
3. Analysis of rate for concrete work
4. Analysis of rate for brick work
5. Analysis of rate for plaster work
6. Estimate quantity of reinforcement
7. Preparation for approximate estimate for road project
8. Estimating cost of building on plinth area method
SURVEY CAMP

Code: BCE 319

List of Experiments

Survey Camp of 4 weeks duration will be held immediately after IVth semester at a Hilly Terrain. The students are required to prepare the Topographical Map of the area by traditional method. Students should also be exposed to modern Survey Equipment and practices, like Total Station, Automatic Level, GPS etc.
Course Title: STRUCTURAL ENGINEERING

Paper Code: BCE 302

Course Objective: This course aims at providing students with a solid background on principles of structural engineering design. Students will be exposed to the theories and concepts of both concrete and steel design and analysis both at the element and system levels.

Learning Outcomes: On completion of the course, the student will be hands-on design experience and skills will be gained and learned through problem sets and a comprehensive design project.

Part-A
Introduction- concepts of energy principles, safety, sustainable development in performance; what makes a structure; principles of stability, equilibrium; what is a structural engineer, role of engineer, architect, user, builder; what are the functions’ what do the engineers design, first principles of process of design, Planning and Design Process; Materials, Loads, and Design Safety

Part-B
Need of analysis, techniques of structural idealization, basic tools of analysis, reactions in structure, notations and sign conventions, free – body diagrams, static determinacy, stability of structures, principle of superposition, loads on structures. Introduction to the analysis and design of structural systems. Analyses of determinate trusses, beams, and frames, and design philosophies for structural engineering.

Part-C
Rolling Loads Introduction to rolling loads and influence lines, Determination of shear force, bending moment at a section and absolute shear force and bending moment due to single point load, uniformly distributed load, several point loads etc. Influence lines: Introduction, moving loads, influence lines, influence lines for reactions, shear force and bending moment, influence lines for beams, trusses and arches, absolute maximum B. M. & S. F, Muller Breslau Principle.

Part-D
Arches: Introduction, curved beams, arch versus a beam, three hinged arch, moment, shears and normal thrust in three hinged arches, Introduction, shape of a loaded cable, cable carrying point loads and UDL, cables with ends at different level, suspension bridge with two hinged and three hinged stiffening girders.

REFERENCES
Course Title: CONSTRUCTION ENGINEERING AND MANAGEMENT

Paper Code: BCE 304

Course Objective: Study of Construction Management functions including Project Management, Cost Management, Time Management, Quality Management, Contract Administration, and Safety Management. Emphasis is put on the application of each function throughout the project phases.

Learning Outcomes: Upon completing the course students will be able to: Define and describe construction processes and various engineering roles involved;

Part-A
Types of organizations-Inspection, control and enforcement -Quality Management Systems and method -Responsibilities and authorities In quality assurances and quality Control- Architects, engineers, contractors, and special consultants, Quality circle.

Part-B
Quality policy -Objectives and methods In Construction Industry -Consumers satisfaction, Economics-Time of Completion -Statistical tolerance -Taguchi’s concept of quality -Codes and Standards -Documents -Contract and construction programming -Inspection procedures -Processes and products -Total QA I QC programme and cost implication

Part-C
Objectives -Regularity agent, owner, design, contract and construction oriented objectives, methods -Techniques and needs of QA/QC -Different aspects of quality - Appraisals, Factors Influencing construction quality

Part-D
Critical, major failure aspects and failure mode analysis -Stability methods and tools, optimum design –Reliability testing- reliability coefficient and reliability prediction - Selection of new materials -Influence of drawings detailing, specification, standardization -Bid preparation- Reliability Based Design.

REFERENCES:


Course Title: DESIGN OF STEEL STRUCTURES

Paper Code: BCE 306

Course Objective: Aim of this paper is to familiarize the students with design of different steel structural elements like compression members and tension members.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of various types of steel elements like Tension member, compression member and flexural member.

Note: Use of IS-800 is allowed in the examination.

Part-A
Rivets and riveting, stresses in rivets, strength & failure of riveted joints. Advantages and disadvantages of bolted connections, stresses in bolts and design of bolted connections. Types of welds & welded joints, stresses in welds, design of welded joints.

Tension Members: Types of tension members, net & gross areas, permissible stresses. Design of members subjected to axial loads, combined bending moments & axial loads, lug angles. [6]

Part-B
Compression Members: Failure modes of columns, end conditions & effective length of columns, various empirical formulae. IS code formula, General codal provisions for design of compression members, Built up compression members, lacing and battening of compression members

Part-C
Column Bases and Foundations: Types of column bases, design of slab base, Gusseted base & grillage foundations.

Design of complete industrial building with design of: Design of Gantry Girders, Design of Column bracket.

Part-D
Design of plate Girders: Components of a plate girder, basic design assumptions, stiffeners inflate girders.

Roof Trusses: Types of roof trusses loads on roof trusses, calculation of forces due to combination of different loads. Design of members and joints.
REFERENCES:

Course objectives: This course provides the students with soil investigation and calculation of earth pressures and stresses under different types of foundations used in civil projects.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of determination of earth pressure and bearing capacity of shallow & deep foundations.

Part-A

Soil Investigation: Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Introduction to the essential features and application of the following types of samples: Open Drive samples, Stationary piston sampler, Rotary sampler, Geophysical exploration by seismic and resistivity methods. Bore Hole log for S.P.T.

Part-B

Earth Pressure: Terms and symbols used for a retaining wall. Movement of wall and the lateral earth pressure. Rankine’s and Coulomb's theory for lateral earth pressure. Culmann's graphical construction and Rebhan's graphical construction.

Stresses in soils: Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence Chart. Contact pressure under rigid and flexible area, computation of displacements from elastic theory.

Part-C


Part-D

Pile Foundation: Necessity and uses of piles, classification of piles. Merits and demerits of different types based on composition. Types of pile driving hammers & their comparison. Effect
of pile driving on adjacent ground. Use of Engineering news formula and Hiley’s formula for
determination of allowable load. Pile Load Test, separation of skin friction and point resistance
using cyclic pile load test data. Related Numerical problems. Determination of point resistance
and frictional resistance of a single pile by static formula. Piles in clay, safe load on a friction
and point bearing pile. Pile in sand spacing of piles in a group, factors affecting capacity of a
pile group. Efficiency of pile group bearing capacity of a pile group in clay. Settlement of pile
groups in clay and sand. Negative skin friction.

CAISONS AND WELLS: Major area of use of caissons Advantages and disadvantages of open box
and pneumatic caissons. Essential part of a pneumatic caisson. Components of a well.
Calculation of allowable bearing pressure. Conditions for stability of a well. Terzaghi’s analysis
for Lateral stability of a well, embedded in sand. Forces acting on a well foundation.
Computation of scour depth, Tilts & Shifts.

REFERENCES:

Course Title: OFFSHORE ENGINEERING

Paper Code: BCE 330

Course Objective: To develop student's ability to understand practical aspects of construction of offshore structures, Deep sea operations. To understand the behavior and movement of rocks under dynamic changes

Learning Outcomes
- The student will get understanding of deep water challenges in construction process
- Have an exposure to various investigation techniques below sea water.

PART-A
Introduction to offshore structures, Construction stages for offshore structure, Principle of constructability, codes of practice,

PART-B

PART-C
In-situ testing, geological aspects; development of design stratigraphies.

PART-D

References:
Course Title: SOIL DYNAMICS

Paper Code: BCE 332

Course Objective: This course provides the students with a good understanding in dynamic nature of soil and theory of vibrations.

Learning Outcomes: After the completion of this course, the participants would gain the knowledge of dynamic earth pressure and dynamic bearing capacity of soil.

Part-A

Part-B
Dynamic Earth pressure and dynamic bearing capacity of shallow foundations.

Part-C
Liquefaction of Soils, Wave propagation in elastic, homogeneous, and isotropic medium. Determining dynamic soil parameters.

Part-D
Machine foundations for reciprocating, impact type and Rotary machines. Vibration isolation and screening.

REFERENCES:
Course Title: BIOLOGICAL PROCESSES FOR CONTAMINANTS REMOVAL

Paper Code: BCE 334

Course Objective: To introduce the various biological process in wastewater treatment

Learning Outcomes: - This course will aid students to understand about the design principles of various biological treatment processes of wastewater

Part A
Constituents of wastewaters- sources –significant parameter - fundamentals of process kinetics, zero order, first order, second order reactions, enzyme reactions – bio reactors- types-classification – design principles.

Part B
Design of wastewater treatment systems-primary, secondary and tertiary treatments.
Evaluation of bio-kinetic parameters-activated sludge and its process – modifications, biological nitrification and denitrification

Part C
Aeration -fundamentals of gas transfer - attached growth biological treatment systems trickling filters-rotating biological contactors - activated bio filters

Part D
Anaerobic processes- process fundamentals-standard, high rate and hybrid reactors, anaerobic filters-expanded/fluidized bed reactors - up flow anaerobic sludge blanket reactors, expanded granular bed reactors- two stage / phase anaerobic reactors, sludge digestion, sludge disposal.

Reference Books:
Course Title: ENVIRONMENT LAWS & POLICIES

Paper Code: BCE 336

Course Objective: To introduce the laws and policies both at the national and international level relating to environment

Learning Outcomes: This course will help the Students to learn different skills needed for interpreting laws, policies and judicial decisions.

Part A
An introduction to the legal system; Constitution, Acts, Rules, Regulations; Indian Judiciary, Doctrine of precedents, judicial review, Writ petitions, Judicial activism.
Introduction to environmental laws in India; Constitutional provisions, Stockholm conference; Rio conference. General principles in Environmental law: Precautionary principle; Polluter pays principle; Sustainable development.

Part B
Wildlife and Biodiversity related laws: Evolution and Jurisprudence of forest and Wildlife laws; Colonial forest policies; Forest policies after independence Statutory framework on Forests, Wildlife and Biodiversity: Biological Diversity Act, 2002; Forest Rights Act, 2006.

Part C

Part D
Environment (Protection) Act 1986 Genesis of the Act – delegation of powers – Role of Central Government - EIA Notification – Sitting of Industries – Coastal Zone Regulation - Responsibilities of local bodies mitigation scheme etc., for Municipal Solid Waste Management - Responsibilities of Pollution Control Boards under Hazardous Waste rules and that of occupier, authorization – Biomedical waste rules – responsibilities of generators and role of Pollution Control Boards
Reference Books:
Course Title: ENVIRONMENT IMPACT ASSESSMENT & LIFE CYCLE ANALYSIS

Paper Code: BCE 338

Course objectives: To learn the concept and methodology of EIA and its documentation.

Learning Outcomes: - The overall aims of the course are for students to acquire understanding of the principles, process, and the necessary techniques for environmental impact assessment, mitigation and monitoring

Part A
Definition and history of environmental impact assessment, related law necessary for EIA, Objectives of Environmental Impact Assessment, Process for EIA, Components of EIA Reports

Part B

Part C
Prediction and assessment of impacts on air and noise; soil and land use; water quantity and quality; biological: terrestrial ecology-forest and wildlife, coastal habitat; human use, quality of life, socio-economic. Consideration of human values in design & execution of projects.

Part D

Reference Books:

Course Title: INTELLIGENT TRANSPORTATION SYSTEMS

Paper Code: BCE 340

Course Objective: This course offers a good understanding in the modern urban transport, design specification and various telecommunication ideas use in modern transportation systems.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of various advance traffic management system and commercial vehicle operations.

Part-A
Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS, Data collection techniques - Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection

Part-B

Part-C

Part-D
Advanced Vehicle safety systems, Information Management; Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

REFERENCE:
2 Sussman, J. M., Perspectives on Intelligent Transportation Systems (ITS), Springer
Course Title: RAILWAY AND AIRPORT ENGINEERING

Paper Code: BCE 342

Part-A


Part-B

Sleepers: Functions and requirements of sleepers, classification of sleepers, timber, metal and concrete sleeper, comparison of different types of sleepers, spacing of sleepers and sleeper density.

Ballast: Function and requirements of ballast, types, comparison of ballast materials.

Geometric design: alignment, horizontal curves, super elevation, equilibrium, cant and cant deficiency, length of transition curve, gradients and grade compensation. Stations and yards, and their classification

Part-C

Points and crossings: Introduction, necessity of points and crossings, turnouts, points and crossings, design of a simple turnout.

Track Recording: Equipment, Mechanized Maintenance, High Speed Trans, Present & Future. Signaling and interlocking: objects of signaling, engineering principle of signaling, classification of signaling, control of train movements, interlocking definition, necessity and function of interlocking, methods of interlocking, mechanical devices for inter locking. Traction and tractive resistance, stresses in track, modernization of railway track.

Part-D

Runway & Taxiway Design: Geometric design of runway, airport capacity, factors controlling taxiway layout, geometric design standards for taxiway holding aprons, Wind-rose diagram, Structural design of runways/pavements LCN/PCN method of rigid pavement design, Pavement Evaluation for runway & taxiway, design of overlay, Terminal area, building area, parking area, apron, hanger typical airport layouts

References:
Course Title: TRANSPORTATION ECONOMICS

Paper Code: BCE 344

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PART -A
Introductory Concepts in Transportation Decision Making:
Overall transportation project development, budgeting, financial planning, the process of transportation project development, models associated with transportation impact evaluation;

PART -B
Transportation costs - Classification of transportation costs, transportation agency costs, transportation user costs, general structure and behavior of cost functions and road pricing.
Estimating Transportation Demand and Supply - supply equilibration, dynamics of transportation demand and supply, elasticity of travel demand and supply, classification of elasticity

Part-C
Vehicle operating costs: Fuel costs - Maintenance and spares, Depreciation - Crew costs - Value of travel time savings - Accident costs. Economics of traffic congestion - Pricing policy;
Economic analysis of projects - Methods of evaluation - Cost-benefit ratio, first year rate of return, net present value, and internal-rate of return methods;

Part-D

References:
Course Title: STRUCTURAL ENGINEERING LABORATORY

Paper Code: BCE 308

List of Experiments

1. Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
2. To determine the Flexural Rigidity of a given beam.
3. To verify the Moment-area theorem for slope and deflection of a given beam.
4. Deflection of a fixed beam and influence line for reactions.
5. Deflection studies for a continuous beam and influence line for reactions.
6. Study of behavior of columns and struts with different end conditions.
7. Experiment on three-hinged arch and experiment on two-hinged arch.
8. Deflection of a statically determinate pin jointed truss.
9. Forces in members of redundant frames.
10. Experiment on curved beams and unsymmetrical bending of a cantilever beam.
Course Title: COMPUTER AIDED CIVIL ENGINEERING DRAWING LABORATORY

Paper Code: BCE 310

List of Drawing Experiments:

1. STARTING WITH ADVANCED SKETCHING
   Drawing Arcs
   Drawing Rectangles
   Drawing Ellipses
   Drawing Regular Polygon
   Drawing Polylines
   Placing Points
   Drawing Infinite Lines
   Writing a Single Line Text

2. Editing Sketches
   Moving the Sketched Objects
   Copying the Sketched Objects.

3. Creating Multiline Text
   Text Window
   Text Editor Tab
   Editing Text.

4. Dimension styles, multileader styles, and system variable

5. Plotting Drawings
   Using the Plot Dialog Box
   Page setup Area
   Printer/plotter Area

Course Title: ENVIRONMENTAL ENGINEERING Lab

Paper Code: BCE 312

1. To measure the pH of given water/wastewater sample.
2. To measure optimum alum dose for coagulation
3. To find turbidity of given water/wastewater sample.
4. To find DO of given water/wastewater sample.
5. To find BOD of given water/wastewater sample.
6. To find COD of given water/wastewater sample.
7. To find Hardness of given water sample.
8. To find Total solids, Total Dissolved solids and Total suspend solids of given water sample.
9. To measure the concentration of sulfates in given water/wastewater sample.
10. To find chlorides in given water/wastewater sample.
11. To find acidity of given water sample.
12. To find alkalinity of given water sample.
13. To find MPN for bacteriological examination of water.
14. To find ambient noise level by using noise level meter.
15. To find RSPM, SPM, SO\textsubscript{x}, NO\textsubscript{x} in air.

Reference:

1. Water and wastewater analysis by CPCB
2. Standard methods for examination of water and wastewater (22\textsuperscript{nd} edition): APHA
3. Water and wastewater testing by R P Mathur.
Course Title: STRUCTURAL ANALYSIS

Paper Code: BCE 401

Course Objective: Aim of this paper is to familiarize the students with different methods used in analysis of indeterminate structures.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of various types of methods used to analyse indeterminate structures.

Part-A

Statically Indeterminate Beams and Frames: Introduction, types of supports-reaction components, external redundancy, statically indeterminate beams and frames, degree of redundancy

Fixed and Continuous Beams: Bending moment diagrams for fixed beams with different loadings, effect of sinking of supports, degree of fixity at supports, advantages and disadvantages of fixed beams, continuous beams, various cases of load and geometry of continuous beams.

Part-B

Classical Methods: Methods of consistent deformation; Theorem of three moments.

Slope Deflection Method: Fundamental equations, Applications to continuous beams and portal frames, side sway in portal frames.

Moment Distribution Method: Basic propositions, stiffness of a member, distribution theorem, carry-over theorem, relative stiffness, distribution factors, applications to continuous beams, portal frames with and without side sway, analysis of multi-storeyed frames, method of substitute frame.

Part-C

Rotation Contribution method: Basic concepts, rotation factor, and application to continuous beams, portal frames and multi-storeyed frames, story shear.


Part-D
Influence lines for indeterminate Structures: Muller Breslau Principle, Influence lines for shear force, bending moment and reactions in continuous beams, balanced cantilevers and rigid Frame.

Introduction to the finite element method for plane stress and plane strain.

REFERENCE:
Course Title: INDUSTRIAL STRUCTURES

Paper Code: BCE 403

Course Objective: This course offers a good understanding in the design of various industrial buildings like Tanks, Chimneys,

Learning Outcomes: After the completion of this course the participants would gain the knowledge about forces acting on different structures, types of frames, its bracing and earthquake resistant design, various types framed as well as other structures.

Part-A
Industrial steel building frames: Types of frames, bracing, crane girders and columns, workshop sheds, trussed bents, Pressed steel tank, circular tank; Transmission and Communication towers: Types and configuration,

Part-B
Analysis and design; Chimneys; Loads and stresses in chimney shaft, Earthquake and wind effect, Stresses due to temperature difference, combined effect of loads and temperature,

Part-C
Design of Silos and Bunkers; Jassen’s theory, Airy’s theory, Shallow and deep bins, Steel Stacks; introduction, force acting on a steel stack, design consideration, design example of Stacks;

Part-D
Concrete Shell Structures: Folded plate and cylindrical shell structures; Introduction structural behavior of long and short shells, beam and arch action, Machine foundations; introduction, machine vibration, structural design of foundation to rotary machines.

REFERENCE:
1. Planning of industrial structures by C.W. Dunham.
2. Structural Engineers Handbook.
3. Design of steel structures-S.K.Duggal
DAV UNIVERSITY, JALANDHAR

DEPARTMENTAL ELECTIVE-IV

Course Title: MODELLING AND ANALYSIS OF UNCERTAINTY

Paper Code: BCE 405

Course Objective: This course is aimed at introducing students, typically from an engineering background to modelling and propagating uncertainty in a probabilistic framework.

Learning Outcomes: After the completion of this course the participants will be able to model various uncertain parameters in a natural or engineering system, especially in a probabilistic way.

Part-A

Deterministic vs. nondeterministic perspectives. Sources of uncertainty. Epistemic vs. aleatoric uncertainty. Data driven vs. physics driven uncertainty modelling. Different approaches such as probabilistic, interval, fuzzy

Part-B


Part-C

Appreciation and understanding of uncertainties and the conditions under which they occur, within the context of the engineering problems solving pedagogy of measurements, models, validation, and analysis.

Part-D

Problems and concerns in obtaining measurements; tabular and graphical organization of data to minimize misinformation and maximize information; and development and evaluation of models.

REFERENCE

1. Uncertainty Modelling and Analysis in Engineering and the Sciences Bilal M Ayyub and George j Klir, Chapman & Hall
Course Title: EARTHQUAKE ENGINEERING

Paper Code: BCE 407

Course Objective: This course should provide the students with good understanding of various types of behaviour of multi-story buildings under earthquake vibrations.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of load analysis of buildings and behaviour of building under earthquake conditions.

Part-A

Philosophy of earthquake resistant design: Ductility, Redundancy & Over strength, Damping, Review of damage in past earthquakes. Criteria for earthquake resistant design, principles of reliable seismic behaviour, structural forms for earthquake resistance, earthquake forces versus other forces.

Part-B


Part-C

Seismic behaviour of Structures: Characteristics of Concrete structures, Steel and masonry structures, Material properties, influence of bond and anchorage and confinement of concrete. Codal Provisions. Introduction to provisions of IS 4326. Introduction to provision of IS 13920

Part-D

Design detailing of Concrete Structures: Seismic design concepts and detailing of reinforced concrete and masonry buildings (IS 13920; IS 13 827: IS 13828; IS 4326) and flexural strength and ductility of RC members, shear behaviour of RC members, beam column joints in moment resisting frames.

REFERENCES-
DAV UNIVERSITY, JALANDHAR

DEPARTMENTAL ELECTIVE-V

Course Title: STRUCTURAL DYNAMICS

Paper Code: BCE 409

Course Objective: This course should provide the students with good understanding of various types of behaviour of vibrations and to be able to perform the dynamic analysis of SDOF and MDOF systems

Learning Outcomes: After the completion of this course the participants would understand basic concepts related to dynamic analysis of structures, perform analysis of SDOF and MDOF, and perform dynamic analysis of various structures.

Part-A

Theory of Vibrations: Difference between Static and Dynamic Loading – Degree of freedom, Idealization of structures, Idealization of structure for single degree of freedom, Effect of Damping – free and forced vibrations of damped and undamped structures- Response to Periodic and Harmonic forces.

Part-B

Undamped free vibrations of single degree of freedom systems: Introduction, definitions, characteristics of a dynamic problem, degrees of freedom, Newton’s law of motion, De Alembert’s Principal, free body diagram, derivations of differential equation of motion, solution of differential equation of motion, equivalent stiffness of spring combinations, springs in series, springs in parallel.

Part-C

Damped free vibrations of single degree of freedom systems: Introduction, types of damping, free vibrations with viscous damping, over-damped, critically- damped and under- damped systems, logarithmic decrement, structural damping.

Part – D

Response of structures to earthquake: Effect of earthquake on different type of structures – Behaviour of Reinforced Concrete structures and Steel structures under different type of loadings.
REFERENCES-
4. A.K. Chopra, Earthquake Engineering Primer
Course Title: RELIABILITY ANALYSIS OF STRUCTURE

Paper Code: BCE 411

Course Objective
Understand use of general concepts of statistics for probabilistic analysis.

- Understand the basic concepts related to reliability analysis of structures.

- Design the structures for various reliability indices.

- The ability to identify the structural systems for various combinations of gravity and horizontal loading considering their functional use and heights. To analyze the behavior and drift capacities of various high rise structural forms.

Learning Outcomes:

- Understand behavior of common structures under gravity and lateral loading

- Understand the drift capabilities of different structural forms

PART-A


PART-B


PART-C


PART-D
Reliability Based Design: Introduction, Determination of partial safety factors, Safety checking formats, Development of reliability based design criteria, Optimal safety factors, Summary of results of study for Indian standard – RCC design. Reliability of Structural Systems: Preliminary concepts as applied to simple structures.

REFERENCES:
1. Ranganatham, R. “Structural Reliability Analysis and Design”
2. Melchers, R.E. “Structural Reliability”
Course Title: PRE-STRESSED CONCRETE

Paper Code: BCE 413

Course Objective: This course should provide the students with good understanding of manufacturing of precast concrete structures.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of design for different pre-stresses and precast members like beams, slabs.

Note: IS 1343 is permitted in examination.

Part-A
Materials for pre-stressed concrete and pre-stressing systems: High strength concrete and high tensile steel – tensioning devices – pre-tensioning systems – post tensioning systems.

Part-B
Analysis of prestress and bending stresses: Analysis of prestress – resultant stresses at a sector – pressure line or thrust line and internal resisting couple – concept of load balancing – losses of prestress – deflection of beams.

Part-C

Part-D
Design of prestressed concrete beams and slabs: Transfer of prestress in pre tensioned and post tensioned members – design of anchorage zone reinforcement – design of simple beams – cable profiles – design of slabs.

REFERENCES:
4. R. Rajagopalan, “Prestressed Concrete”.
5. IS 1343 2012 Code of Practice for PrestressedConcrete
DAV UNIVERSITY, JALANDHAR

DEPARTMENTAL ELECTIVE-VI

Course Title: DESIGN OF STRUCTURAL SYSTEM

Paper Code: BCE 415

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Course Objective: This course provide a better understanding of the Structural Design, Design requirements

Learning Outcomes: After the completion of this course the participants would gain the knowledge of Awareness among the components of structure design.

Part-A
Planning and Design Process of structure, Materials and Structural Design Criteria

Part-B
Loads and Design Safety of functional requirements, selection of structural scheme

Part-C
Formulation of design criteria, preliminary and computer-aided proportioning

Part-D
Analysis of response, cost, and value

REFERENCES


11. ACI, *Building Code Requirements for Structural Concrete (ACI 318-99) and Commentary (ACI 318R-99)*, American Concrete Institute, 1999.

Course Title: MASONARY STRUCTURE

Paper Code: BCE 417

Course Objective: Covers masonry unit type and grades of mortar types, reinforcing and connectors. Design of beams, columns, pilasters, and walls. Structural behavior and construction practices. Includes plain and reinforced masonry. Building codes, Masonry Standard Joint Committee (MSJC) specifications

PART A

PART B
Permissible stresses: Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral load, permissible tensile stress and shear stresses.
Design Considerations: Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls, cavity walls, wall with pillars

PART C
Load considerations and design of Masonry subjected to axial loads: Design criteria, design examples of walls under UDL, solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers.

PART D
Design of walls subjected to concentrated axial loads: Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers, design of wall with openings.

Design of walls subjected to eccentric loads: Design criteria – stress distribution under eccentric loads – problems on eccentrically loaded solid walls, cavity walls, walls with piers.

REFERENCES


2. Building Code Requirements for Masonry Structures, American Concrete Institute, 2002, Farmington Hills, MI.


DAV UNIVERSITY, JALANDHAR

DEPARTMENTAL ELECTIVE-VII

Course Title: SUSTAINABLE CONSTRUCTION METHODS

Paper Code: BCE 419

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Course Objective: Sustainable construction materials and methodologies related to commercial construction, including LEED/Green certifications. Demonstrate an ability to evaluate and/or design whole or parts of projects, taking into account not only the financial and economic issues but also the social and environmental impacts affecting the Sustainability of infrastructure.

PART A

Principles of Sustainability Introduction to Sustainability Major Environmental Challenges Global Warming Introduction to Green Buildings; LEED Greening Our Campus Sustainable Urban Development Sustainable Sites - LEED Credits.

PART B


PART C

Green Materials Materials and Resources - LEED Credits Building Deconstruction, C&D Recycling Indoor Environmental Quality – Basic IEQ - LEED Credits Building Commissioning

PART D

Economics of Green Construction Economics of Green Buildings LCC/LCA Green Home Construction Evaluate feasibility of alternative products and solutions based on life-cycle analysis (LCA) methods

REFERENCES

DAV UNIVERSITY, JALANDHAR

DEPARTMENTAL ELECTIVE-VII

Course Title: CONSTRUCTION EQUIPMENT AND AUTOMATION

Paper Code: BCE 421

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Course objectives: -To enlighten students about different new techniques available around the globe

Learning Outcomes: - Students will learn different characteristics of different construction equipment.

Part A
Introduction to Conventional construction methods Vs Mechanized methods and advantages of latter

Part B
Different equipment used in construction: - Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; plastering machines; Prestressing jacks and grouting equipment.

Part C
Heavy Machinery: - Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities;

Part D
Aerial and Satellite Surveying: GIS and GPS in Construction; use of Drones for spread out sites; Use of robots for repetitive activities

Reference Books:
3. GPS satellite surveying - Alfred Leick, Wiley
Course Title: CONSTRUCTION COST ANALYSIS

Paper Code: BCE 423

Course Objectives: To bring about a understanding of costing of construction projects. Estimating construction costs using different methods is a first step in financial costing and cost control. In addition to conventional cost it is also necessary to determine costs in terms of components like materials, labours, plant and equipment etc. at different stages of construction.

Learning Outcomes: Students will develop skills to control cost and cost monitoring and will also well familiarized with the techniques of revision of costs, cost forecasting and cost control.

PART-A
Introduction to the application of scientific principles to costs and estimates of costs in construction engineering, concepts and statistical measurements of the factors involved in construction cost.

PART-B
Concepts and statistical measurements of the factors involved in direct costs, general overhead costs, cost markups and profits.

PART-C
Determining the funds required for a construction job; preparing cash flow statements; cash inflow and outflow during contract period; project expectations.

PART-D
The fundamentals of cost recording for construction cost accounts and cost controls. Precautions in custody of cash, imprest account and temporary advance; maintenance of temporary advance; and advance account; different types of payment, first, running, advance and final payments.

REFERENCES
2. Gobourne: Cost control in the construction industry.
3. Schedule of rates, specification manuals etc. from PWD
4. Chris Hendrickson and Tung Au: Project Management for Construction
Course Title: PROJECT 1

Paper Code: BCE 425

Students are required to work on project in any of the areas related to Civil Engineering. The students will work with his / her supervisor(s).

Any one from following specialization:

1. Environment Engineering
2. Geo-Tech. Engineering,
3. Transportation Eng.,
4. Hydraulic Structures
5. Structural Engineering
Course Title: INDUSTRIAL TRAINING

Paper Code: BCE 427

Field training including software that enhances professional capability in civil engineering practice.
Course Title: SEMINAR

Paper Code: BCE 429

The seminar is based on research oriented topic. The evaluation is based upon the contents of topic and the presentation.
Course Title: ECOLOGICAL ENGINEERING

Paper Code: BCE 402

Course Objective: To understand the concept and application of ecology in Engineering

Learning Outcomes: Students will learn the basics of ecological systems and introduce them to the concept of ecological engineering

Part A
Ecology: Definition and scope of ecology, types of ecosystem, abiotic and biotic environments, biotic – abiotic interactions, Population ecology, Community structure, two-species interactions, food webs, succession, disturbance and succession, negative and positive feedbacks in succession. Energy flows, nutrient cycling

Part B
Classification of eco technology – Principles and components of Systems and Modeling – Structural and functional interactions in environmental systems – Human modifications of environmental systems.

Part C

Part D

Reference Books:
Course Title: AIR & NOISE POLLUTION CONTROL

Paper Code: BCE 404

Course Objective: To familiarize the students with the basics of air and noise pollution including atmospheric physics and chemistry.

Learning Outcomes: This Course will help the students to apply these concepts to Air and noise Pollution Control and Environmental Management

Part A
Introduction to air pollution– environmental engineering significance – global issues – units, Effects of air pollution– visibility – basic calculations Atmospheric composition – temperature profile

Part B

Part C
Air pollution sampling– Stack monitoring, control measures, Indoor air quality models, Air pollution control of stationary & mobile sources.

Part D

Reference Books:
2. Environmental Pollution Control Engineering, Rao, C S, New Age Pub. New Delhi,2nded
Course Title: SOLID WASTE MANAGEMENT

Paper Code: BCE 406

Course Objective: To educate the students on the principals involved in the management of municipal solid waste from source identification up to disposal.

Learning Outcomes: - Students will learn how to handle solid waste efficiently without harming environment

Part A
Introduction to solid waste:- Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management, Legislations on management and handling of municipal solid wastes, hazardous wastes, and biomedical wastes, Elements of integrated waste management.

Part B
Waste characterization and analysis Waste generation rates, Composition, Hazardous Characteristics, waste sampling, Source reduction of wastes, Recycling and reuse.
Management of solid waste Handling and segregation of wastes at source, storage and collection of municipal solid wastes, Analysis of Collection systems, need for transfer and transport – Transfer stations - labeling and handling of hazardous wastes.

Part C
Waste processing – processing technologies, biological and chemical conversion technologies, Composting, thermal conversion technologies, energy recovery, incineration, solidification and stabilization of hazardous wastes, treatment of biomedical wastes.

Part D
Disposal on landfill Disposal in landfills - site selection, design and operation of sanitary landfills, secure landfills and landfill bioreactors, leachate and landfill gas management, landfill closure and environmental monitoring, landfill remediation.

Reference Books:
2. CPHEEO Manual on Municipal Solid Waste Management.


Course Title: DESIGN OF CONCRETE STRUCTURE-II

Paper Code: BCE 408

**Course Objective:** To develop an understanding of and appreciation for basic concepts in the behavior and design of reinforced concrete systems and elements. To introduce the basic concepts and steps for reinforced concrete sectional design mainly in accordance with ultimate strength design.

**Learning Outcomes:** Able to understand the general mechanical behavior of reinforced concrete in accordance with IS 456:2000. Able to analyze and design with detailing for stair case, water tanks, curved beam, footings etc and able to analyze transfer and development length of concrete reinforcement.

**Note:** Indian Codes IS 456-2000 & SP16 of Practice and Design handbooks are permitted in examination.

**Part-A**
Redistribution of moments: Introduction ;limit analysis applied to RC beam fixed at ends, Moment curvature relationship, Continuous beam and one way continuous slab
Design of staircases: - Introduction, Types of stair case, Design considerations, design of Dog-legged and open- well staircase.

**Part-B**
RCC Footings - Theory and Design: Isolated Footing (Square, Rectangular), Combined Footing (Rectangular, Trapezoidal, Strap), Raft Footing

**Part-C**
Beams curved in plan: Design of semi-circular beams supported on three supports. Design of circular beam supported on symmetrically placed columns.
Building Frames: Load patterns for critical conditions, design of continuous beams, slabs, columns, detailing of reinforcement in the same. (Use of SP16)

**Part-D**
Retaining walls: Cantilever type retaining wall, Counter fort type retaining wall.
Water tank and staging; Introduction, Design criteria, Design of rectangular and circular water tank, Design of Intze tank, Staging for overhead tank;
REFERENCES:

6. Design of Reinforced Concrete Structure by P Dayaratnam P Sarah
8. Reinforced concrete design by Abi O. Aghayere
Course Objective: This course should provide the students with good understanding of matrix methods used to analyse indeterminate structures.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of Flexibility and stiffness methods of structural analysis.

Part-A

Part-B
Flexibility method of Analysis: Introduction, method of consistent deformation, application to pinjointed frames, effect of temperature and pre-strain, displacements and forces in members of indeterminate structures, flexibility matrix of a plane member.

Part-C

Part-D
Computer Applications: Matrix structural analysis using spreadsheets, MS Excel MatrixCommands, MS Excel procedure for stiffness method of analysis, analysis of single span beams, continuous beams, plane trusses and plane frames.

REFERENCES

Course Title: ENVIRONMENTAL GEOTECHNOLOGY

Paper Code: BCE 412

Course Objectives

- To understand the behaviour of soil minerals
- To familiarize with the interaction of soil and water

Learning Outcomes

- Upon successful completion of this course, the student would:
- Have an exposure to interdisciplinary issues pertaining to environment and geotechnical engineering
- Be trained to develop sustainable and environmentally sound solutions for geotechnical problems
- Understand the relevance of various legal aspects involved in addressing environmental consequences associated with geotechnical issues

PART-A

Introduction and soil mineralogy: Scope of environmental geotechnology and its applications,
Soil Formation, Composition and Structure: Introduction, Soil formation, Solids composition and characterization, Mineral composition, Different scales of soil structure, Structural variations due to consolidation and compaction, Role of Composition and soil structure in the engineering behavior of soils.

PART-B

Contamination in soils: Subsurface contamination, Mass transport mechanisms, Mass transfer mechanisms, Governing equation for mass transport, Soil as a geotechnical trap, effects of subsurface contamination its detection and monitoring.
Mechanisms of soil-water interaction: Diffuse double layer and simple DDL models; Force of attraction and repulsion; Soil-water-contaminant interaction; Effect of contaminants on engineering properties of soil.

PART-C
Site investigation: Introduction, Site investigation approach, phase investigations, Geophysical techniques, Hydro-geological investigations, Hydro-geochemical investigations, Geochemical data collection and analysis.

PART-D

Concepts of waste containment facilities: Desirable properties of soil; contaminant transport and retention; containment of solid waste in landfills, environmental impact of slurry waste and containment of slurry wastes, contaminated site remediation.

Case histories: Case histories on geo-environmental problems pertaining to use of readily available local soils, bio-remediation of spills etc.

References:
4. Hsai_Yang Fang and Daniels, J.L. Introductory Geotechnical Engineering an Environmental Perspective, Taylor & Francis, Oxon., 2006
7. CDEEP, IITB video lectures on course CE 488 and CE 641 by Prof. D. N. Singh
Course Title: PORT AND HARBOUR ENGINEERING

Paper Code: BCE 414

Course Objectives: To know about the better planning and design of docks-harbour, Port activities and infrastructure facilities. Planning of new port requires proper knowledge of location, natural phenomena, environmental impacts, hinterland products, connectivity, forecast of passenger and cargo demand, infrastructure and management aspects.

Learning Outcomes: To enhance the knowledge of Docks and Harbour Engineering for the water transportation in the context of regional and intercontinental transportation. To know techniques of planning and designing the infrastructures required for Harbour and Port area. To know regarding cargo and passenger demand forecasting, cargo handling capacity of ports and economic evaluation of port project. To be aware of the environmental and other impacts impended due to water transportation and port activities.

Part-A
Water Transportation: Scope, Merits, Developments of Water Transportation in India, Inland waterways, River, Canal, Inland water transportation, Development of ports & Harbours, Harbour classification, Site selection, Harbour dimensioning.

Part-B
Natural Phenomena: Wind, Tides, Water waves, Wave decay & port, wave diffraction, breaking, reflection, Littoral drift, sediment transport, Effects on Harbour and structure design.

Part-C
Harbour Infrastructures: Types of breakwaters, jetty, dock fenders, piers, wharves, dolphin, mooring accessories, Repair facilities, wet docks, lift docks, dry docks, gates for graving docks, floating docks, slipways, locks and gates

Part-D
Port facility: Transit shed, warehouses, cargo handling, container handling, Inland port facility, Navigational aids, types, requirements of signals, lighthouses, beacon light, buoys. Dredging & coastal protection: Types of dredgers, choices, usage of dredged material, sea wall protection-sea wall revetment, bulkhead
Planning of ports: For regional and intercontinental transportation development, forecasting cargo & passenger demand, regional connectivity, cargo handling capacity of port, economic evaluation of port project, impacts of port activities.

REFERENCES:

1. Port and Harbour Engineering: 6 (Studies in the History of Civil Engineering) by Adrian Jarvis
2. Handbook of Port and Harbor Engineering: Geotechnical and Structural Aspects by Gregory Tsinker
3. Port Engineering by Per Bruun
4. Ocean engineering by NPTEL
6. Port Engineering, Volume 1: Harbor Planning, Breakwaters, and Marine Terminals by Dr. Per Bruun
7. Port Engineering, Volume 2: Harbor Transportation, Fishing Ports, Sediment Transport, Geomorphology, Inlets, and Dredging by Dr. Per Bruun
Course Title: DESIGN OF HYDRAULIC STRUCTURES

Paper Code: BCE 416

Course Objectives: This course should provide the students with good understanding of various types of irrigation projects like weirs and barrages.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of canal regulation and design steps of irrigation projects like weirs and barrages.

Part-A
Head Works: Types of head works, Functions and investigations of a diversion head Work: component parts of a diversion head work and their design considerations, silt control devices.

Theories of Seepage: Seepage force and exit gradient, assumptions and salient features of Bligh’s Creep theory, Limitations of Bligh's Creep theory, salient features of Lane's weighted Creep theory and Khosla's theory, Comparison of Bligh’s Creep theory and Khosla's theory, Determination of uplift pressures and floor thickness.

Part-B
Design of Weirs: Weirs versus barrage, types of weirs, main components of weir, causes of failure of weir and design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.

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

Part-C
Canal Regulators: Off take alignment, cross-regulators–their functions and design, Distributory head regulators, their design, canal escape.

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

Part-D
Cross-Drainage works: Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons and level crossing.
Canal Outlets: Essential requirements, classifications, criteria for outlet behaviours, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of non modular, semi-modular and modular outlets.

REFERENCES:

Course Objective: This course provides a better understanding of various techniques of repairing the structures, causes of deterioration.

Learning Outcomes: After the completion of this course the participants would gain the knowledge modern materials and techniques of repairing.

Part-A
Maintenance and Repair Strategies Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration

Part-B
Strength and Durability of Concrete - Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion – Effects of cover thickness

Part-C

Part-D
Coatings to reinforcement, cathodic protection; Repair, Rehabilitation and Retrofitting of Structures - Evaluation of root causes; Underpinning & shoring; some simple systems of rehabilitation of structures; Guniting, shotcreting; Non-Destructive testing systems; Use of external plates, carbon fibre wrapping and carbon composites in repairs. Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Demolition Techniques – Engineered demolition methods – Case studies
REFERENCES

Course Title: Professional Communication

Paper Code: ENG352

Course Objective: This paper, with a practice-oriented approach, aims to hone students’ skills in the major dimensions of professional communication.

Learning Outcome: Students will show adequate understanding of professional communication skills.

PART A

- Professional Communication: Technical Communication and Business Communication
- Verbal and Non-Verbal Communication
- Barriers to Communication

(N.B. As the topics are largely theoretical, teacher shall introduce the topics in classroom in the form of lectures and encourage students to read on their own from the reference books. All these topics will be supported by examples from real life situations.)

PART B

- Reading Skills: Active & Passive Reading, Reading strategies, and Developing a Good Reading Speed
- Listening Skills: Types of Listening & Effective Listening Strategies
- Speaking Skills: Basics in Phonetics
- Writing Skills: Topic Sentence and Paragraph (descriptive, narrative, expository, and persuasive)

(N.B. Teacher will encourage students to apply the theoretical knowledge while practicing the four skills. Opportunities to practice the language skills should be created for students in the classroom.)

PART C

- Conversation: Formal and Informal
- Panel Discussion and Group Discussion
- Oral Presentation

(N.B. Teacher will give supporting examples from the industry and encourage students to do relevant exercises.)

PART D
DAV UNIVERSITY, JALANDHAR

- C.V. and Cover Letter
- Interview Skills
- Professional Letters
- Report Writing and Memo

(N.B. Teacher will give supporting examples from the industry and encourage students to do relevant exercises.)

Testing: The examinations will be conducted as per the norm of the university.

References:


c. Websites

8. [www.youtube.com](http://www.youtube.com) (to watch standard videos)
10. [https://owl.english.purdue.edu/](https://owl.english.purdue.edu/)
Course Title: PROJECT 2

Paper Code: BCE 420

Course Objectives:
Students are required to work on project in any of the areas related to Civil Engineering. The students will work with his / her supervisor(s).
Any one from following specialization:
- Environment Engineering
- Geo-Tech. Engineering,
- Transportation Eng.,
- Hydraulic Structures
- Structural Engineering.
Course Title: CONSTRUCTION MATERIALS AND TECHNIQUES

Course Code: BCE 801

Course Objectives:

Course Objective: This course offers a good understanding and study of different materials and material properties in civil engineering.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of various materials used in construction, their properties, uses and type of construction work for which they can be used.

Part-A

Building Stones: General, Uses of stones, natural bed of stones, qualities of a good building stone, deterioration of stones, artificial stones, common building stones of India and their uses. Bricks: General, Composition of good brick earth, Harmful ingredients in brick earth, qualities of good bricks, tests for bricks, classification of bricks. Timber: Definition, classification of trees, structure of a tree, felling of trees, seasoning of timber, storage of timber, market forms of timber.

Part-B


Part-C

Brick and stone masonry: Terms used, Types of bonds & their merits and demerits, rubble and ashlars joints in stone masonry, cement concrete hollow blocks and their advantages and disadvantage. Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

Part-D

Plastering and pointing: Objects, Methods of plastering, Materials and types, Defects in plastering, special material for plastered surface, Distempering white washing and colour washing. Foundation: Definition, types of foundations
REFERENCE:

3. Shetty MS , “Concrete Technology” S. Chand & Co. N. Delhi, 2005
Course Title: RAILWAY AND TUNNEL ENGINEERING

Course Code: BCE 802

Course Objectives:

Course Objective: This course should provide the students with good understanding of railway and Tunnel engineering.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of various railways transportation components and specifications of tunnels.

Part-A


Part-B

Stations and yards: Selection of site for station and yards, different types of stations and yards and their layouts-way side station. Permanent way Construction and Maintenance: Laying of track, relaying and dismantling, maintenance of track. Signaling and Interlocking: Objects of signalling, types of signals, Interlocking and devices used in interlocking.

Part-C

Tunnels: Definition and necessity of tunnels, Typical section of tunnels for a national highway and single and double broad gauge railway track.

Part-D


REFERENCES
5. Subhash C Saxena “Tunnal Engineering”, Dhanpat Rai and Sons, Delhi
Course Title: Metro Systems and Engineering

Course Code: BCE 803

Course Objectives: This course should provide the students with good understanding of metro systems in India

Learning Outcomes: After the completion of this course the participants would gain the knowledge of various metro transportation components and specifications of systems.

PART A
Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials
Civil engineering-Overview and construction methods for metro systems.

PART B
Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots;
Commercial and Service buildings. Tunnel Ventilation systems; Air conditioning for stations
and buildings; Fire control systems

PART C
Initial Surveys & Investigations; Basics of Construction Planning & Management, Construction
Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities;
Environmental and social safeguards; Track systems-permanent way. Facilities Management

PART D
Signaling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA
and other control systems; Platform Screen Doors.

REFERENCES
1840008385
10 of the world’s most important metro systems.
3. William D. Middleton: Metropolitan Railways: Rapid Transit in America (Railroads Past and