

## Bachelor of Technology (CIVIL Engineering), KUK

### SCHEME OF STUDIES/EXAMINATIONS (Modified) (Semester -III) Credit-Based (w.e.f. 2019-20)

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	HM-251A	Introduction to Civil Engineering	2:0:0	2	2	75	25	0	100	3
2	BS-204A	Higher Engineering Mathematics	3:0:0	3	3	75	25	0	100	3
3	CE-201A	Introduction to Solid Mechanics	3:0:0	3	3	75	25	0	100	3
4	CE-203A	Introduction to Fluid Mechanics	2:1:0	3	3	75	25	0	100	3
5	CE-205A	Surveying & Geomatics	3:0:0	3	3	75	25	0	100	3
6	CE-207A	Building Construction Practice	3:0:0	3	3	75	25	0	100	3
7	CE-213LA	Fluid Mechanics Lab	0:0:2	2	1	-	40	60	100	3
8	CE-215LA	Surveying & Geomatics Lab	0:0:2	2	1	-	40	60	100	3
9	CE-217LA	Computer-aided Civil Engineering Drawing	0:0:2	2	1	-	40	60	100	3
10	MC-901A**	Environmental Sciences	2:0:0	2	0	75	25	0	100	3
11	<b>SIM-201A*</b>	Seminar on Summer Internship*	2:0:0	2	0	--	50	0	50	
		Total	20:1:6	27	20	450	270	180	900	

**Note:** \*Note: SIM-201A\* is a mandatory credit-less course in which the students will be evaluated for the Summer Internship (training) undergone after 2nd semester and students will be required to get passing marks to qualify.

MC-901A\*\* is a mandatory credit less course in which the student will be required to get passing marks in the major test.

**Bachelor of Technology (CIVIL Engineering), KUK**  
**SCHEME OF STUDIES/EXAMINATIONS (Modified)**  
**(Semester -IV) Credit-Based (w.e.f. 2019-20)**

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						Major Test	Minor Test	Practical	Total	
1	HM-252A	Civil Engineering - Societal & Global Impact	2:0:0	2	2	75	25	0	100	3
2	ES-205A	Engineering Mechanics	3:0:0	3	3	75	25	0	100	3
3	CE-202A	Structural Analysis-I	3:1:0	4	4	75	25	0	100	3
4	CE-204A	Design of Steel Structure-I	4:0:0	4	4	75	25	0	100	3
5	CE-206A	Soil Mechanics	3:0:0	3	3	75	25	0	100	3
6	CE-208A	Hydraulic Engineering	3:0:0	3	3	75	25	0	100	3
7	CE-212LA	Structural Analysis-I Lab	0:0:2	2	1	-	40	60	100	3
8	CE-216LA	Soil Mechanics Lab	0:0:2	2	1	--	40	60	100	3
9	CE-218LA	Hydraulic Engineering Lab	0:0:2	2	1	--	40	60	100	3
		Total	18:1:6	25	22	450	270	180	900	

B. Tech (3 <sup>rd</sup> Semester) Civil Engineering							
HM-251A	Introduction to Civil Engineering						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs)
2	0	0	2	75	25	100	3

#### UNIT-I

**Basic Understanding:** What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career, 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.

#### **Structural Engineering:**

Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies;

#### UNIT-II

#### **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;

**Surveying & Geomatics:** Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR;

#### UNIT-III

**Fundamentals of Building Materials:** Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes.

#### **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

#### UNIT-IV

#### **Environmental Engineering & Sustainability:**

Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction.

#### **Hydraulics, Hydrology & Water Resources Engineering:**

Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multipurpose reservoir projects

#### **Text/Reference Books:**

1. Basic Civil and Mechanical Engineering, G. Shanmugam & M.S. Palanichamy, McGeraw Hill Education(India) Private Limited, Chennai.
2. Basic Civil and Mechanical Engineering, Shamugasundaram, Cengage New Delhi.
3. Basic Civil and Mechanical Engineering, by [Dhale Shrikrishna A. & Tajne Kiran](#) , S. Chand's Publication New Delhi.

**Note:** The examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.

BS-204A		HIGHER ENGINEERING MATHEMATICS					
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	-	-	3	75	25	100	3 h
Purpose	The objective of this course is to familiarize the prospective Engineers with Laplace Transform, partial differential equations which allow deterministic mathematical formulations of phenomena in engineering processes and to study numerical methods for the approximation of their solution. More precisely, the objectives are as under:						
<b>Course Outcomes</b>							
CO 1	Introduction about the concept of Laplace transform and how it is useful in solving the definite integrals and initial value problems.						
CO 2	To introduce the Partial Differential Equations, its formation and solutions for multivariable differential equations originated from real world problems.						
CO 3	To introduce the tools of numerical methods in a comprehensive manner those are used in approximating the solutions of various engineering problems.						
CO 4	To familiar with essential tool of Numerical differentiation and Integration needed in approximate solutions for the ordinary differential equations.						

#### UNIT-1

##### Laplace Transform

Laplace Transform, Laplace Transform of Elementary Functions, Basic properties of Laplace Transform, Laplace transform of periodic functions, finding inverse Laplace transform by different methods, Convolution theorem, solving ODEs by Laplace Transform method.

#### UNIT-2

##### Partial Differential Equations

Formation of Partial Differential Equations, Solutions of first order linear and non-linear PDEs, Charpit's method, Solution to homogenous linear partial differential equations (with constant coefficients) by complimentary function and particular integral method.

#### UNIT-3

##### Numerical Methods-1

Solution of polynomial and transcendental equations: Bisection method, Newton-Raphson method and Regula-Falsi method, Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

#### UNIT-4

##### Numerical Methods-2

Numerical Differentiation using Newton's forward and backward difference formulae, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules, Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations.

##### Textbooks/References:

1. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993. AICTE Model Curriculum in Mathematics.
2. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.
3. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.
4. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
8. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
9. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
10. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
11. Erwin Kreyszig and Sanjeev Ahuja, Applied Mathematics-II, Wiley India Publication, Reprint, 2015.

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B. Tech (3 <sup>rd</sup> Semester) Civil Engineering							
CE-201A	Introduction to Solid Mechanics						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs)
3	0	0	3	75	25	100	3

### UNIT-I

#### Analysis of stresses and strains:

Analysis of simple states of stresses and strains, elastic constraints, bending stresses, theory of simple bending, flexure formula, combined stresses in beams, shear stresses, Mohr's circle, Principle stresses and strains, torsion in shafts and closed thin walled sections, stresses and strains in cylindrical shells and spheres under internal pressure.

#### Theory of Columns:

Slenderness ratio, end connections, short columns, Euler's critical buckling loads, eccentrically loaded short columns, cylinder columns subjected to axial and eccentric loading.

### UNIT-II

#### Bending moment and shear force in determinate beams and frames:

Definitions and sign conventions, axial force, shear force and bending moment diagrams.

#### Three hinged arches:

Horizontal thrust, shear force and bending moment diagrams.

### UNIT-III

#### Deflections in beams:

Introduction, slope and deflections in beams by differential equations, moment area method and conjugate beam method, unit load method, principle of virtual work, Maxwell's Law of Reciprocal Deflections, Williot's Mohr diagram.

### UNIT-IV

#### Analysis of statically determinate trusses:

Introduction, various types, stability, analysis of plane trusses by method of joints and method of sections, analysis of space trusses using tension coefficient method.

#### Text Books

- 1) Structural Analysis-I, Bhavikatti S.S., Vikas Pub.House, N.Delhi.
- 2) Strength of Materials, Dr. Sadhu Singh, Khanna Publishers
- 3) Fundamentals of Structural Analysis, M.K.Pant, S.K.Kataria & Sons, N.Delhi

#### Reference Books

- 1) Strength of Materials Part-I, S.Timoshenko, Affiliated East-West Press, New . Delhi
- 2) Mechanics of Solids, Prasad, V. S. Gakgotia Pub., New Delhi.
- 3) Elementary Structural Analysis, Jain, A. K., Nem Chand & Bros, Roorkee.
- 4) Elementary Structural Analysis, Wibur & Nooris, McGraw Hill Book Co., Newyork.

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B. Tech (3 <sup>rd</sup> Semester) Civil Engineering							
CE-203A	Introduction to Fluid Mechanics						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs)
2	1	0	3	75	25	100	3

### UNIT-I

#### Introduction:

Fluid properties, mass density, specific weight, specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble due to surface tension, compressibility viscosity, Newtonian and Non-Newtonian fluids, real and ideal fluids.

#### Kinematics of Fluid Flow:

Steady & unsteady, uniform and non-uniform, laminar & turbulent flows, one, two & three dimensional. flows, stream lines, streak lines and path lines, continuity equation in differential form, rotation and circulation, elementary explanation of stream function and velocity potential, rotational and irrotational flows, graphical and experimental methods of drawing flow nets.

### UNIT-II

#### Fluid Statics:

Pressure-density-height relationship, gauge and absolute pressure, simple differential and sensitive manometers, two liquid manometers, pressure on plane and curved surfaces, center of pressure, Buoyancy, stability of immersed and floating bodies, determination of metacentric height, fluid masses subjected to uniform acceleration, free and forced vortex.

### UNIT-III

#### Dynamic of Fluid Flow:

Euler's equation of motion along a streamline and its integration, limitation of Bernoulli's equation, Pitot tubes, venture meter, Orifice meter, flow through orifices & mouth pieces, sharp crested weirs and notches, aeration of nappe.

### UNIT-IV

#### Boundary layer analysis:

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local and average friction coefficient, separation and its control.

#### Dimensional Analysis and Hydraulic Similitude:

Dimensional analysis, Buckingham theorem, important dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies, physical modeling, similar and distorted models.

#### Text Books

- 1) Hydraulic and Fluid Mechanics by P.N.Modi & S.M.Seth
2. Fluid Mechanics and Hydraulic Machines, Sukumar Pati, McGeraw Hill Education (India) Private Limited, New Delhi.
- 2) Fluid Mechanics and Hydraulic Machines, Dr. R.K.Bansal, Luxmi Publication

#### Reference Books

- 1.Introduction to Fluid Mechanics by Robert W.Fox & Alan T.McDonald
2. Introduction to Fluid Mechanics and Hydraulic Machines, S.K.Som, G. Biswas & S. Chakraborty, McGeraw Hill Education (India) Private Limited.
- 2) Fluid Mechanics Through Problems by R.J.Garde
- 3) Engineering Fluid Mechanics by R.J.Garde & A.G.Mirajgaoaker

**Note: The paper setter will set the paper as per the question paper templates provided.**

B. Tech. (3 <sup>rd</sup> Semester) Civil Engineering							
CE-205A Survey and Geomatics							
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	75	25	100	3

### Unit I

#### Introduction to Surveying

Fundamental Principles of Surveying, Survey Stations, Survey Lines – Ranging, Methods of traversing, instruments for measurement of angles-prismatic and surveyor's compass, bearing of lines, local attraction, examples

#### Triangulation and Trilateration

Theodolites Survey: Instruments, temporary adjustment of theodolite, measurement of angles, repetition and reiteration method, traverse surveying with theodolite, checks in traversing, adjustment of closed traverse, examples. Intervisibility of Height and Distances: Trigonometric Levelling, Axis Signal Corrections

### Unit II

#### Levelling:

Definition of terms used in levelling, types of levels and staff, temporary adjustment of levels, principles of leveling, reduction of levels, booking of staff readings, examples

#### Contours:

Definition, representation of reliefs, horizontal equivalent, contour interval, characteristics of contours, methods of contouring, contour gradient, uses of contours maps.

#### Plane Table Surveying:

Plane table, methods of plane table surveying, radiation, intersection, traversing and resection, two point and three point problems.

### Unit III

#### Curves:

Classification of curves, elements of simple circular curve, location of tangent points-chain and tape methods, instrumental methods, examples of simple curves. Transition Curves-Length and types of transition curves, length of combined curve, examples. Vertical Curves: Necessity and types of vertical curves.

#### Modern Field Survey Systems:

Principle of Electronic Distance Measurement, Modulation, Types of EDM Instruments. Working principle and survey with total station.

### Unit IV

#### Elements of Photogrammetry:

Introduction: types of photographs, types of aerial photographs, aerial camera and height displacements in vertical photographs, stereoscopic vision and stereoscopies, height determination from parallax measurement, flight planning,

#### Introduction of remote sensing and its systems:

Concept of G.I.S and G.P.S. -Basic Components, data input, storage & output.

#### Text Books

1. Surveying Vol.I & II by B.C.Punmia
2. Surveying Vol.I & II by S.K.Duggal, TMH Publication

#### Reference Books

1. Surveying Vol.I by T.P.Kanitkar

B. Tech (3 <sup>rd</sup> Semester) Civil Engineering							
CE-207A	Building Construction Practice						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	4	75	25	100	3

#### UNIT-I

##### **Masonry Construction:**

Introduction, various terms used, stone masonry-Dressing of stones, Classifications of stone masonry, safe permissible loads, Brick masonry-bonds in brick work, laying brick work, structural brick work-cavity and hollow walls, reinforced brick work, Defects in brick masonry, composite stone and brick masonry, glass block masonry.

##### **Cavity and Partition Walls:**

Advantages, position of cavity, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall.

##### **Foundation:**

Functions, types of shallow foundations, sub-surface investigations, geophysical methods, general feature of shallow foundation, foundations in water logged areas, design of masonry wall foundation, introduction to deep foundations i.e. pile and pier foundations.

#### UNIT-II

##### **Damp-Proofing and Water-Proofing:**

Defects and causes of dampness, prevention of dampness, materials used, damp-proofing treatment in buildings, water proofing treatment of roofs including pitched roofs.

##### **Roofs and Floors:**

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings.

##### **Doors and Windows:**

Locations, sizes, types of doors and windows, fixtures and fasteners for doors and windows.

#### UNIT-III

##### **Brick and Tiles:**

Classification of bricks, constituents of good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks. Tiles: Terra-cotta, manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra-cotta.

##### **Limes, Cement and Mortars:**

Classification of lime, manufacturing, artificial hydraulic lime, pozzolona, testing of lime, storage of lime, cements composition, types of cement, manufacturing of ordinary Portland cement, testing of cement, special types of cement, storage of cement.

Mortars: Definition, proportions of lime and cement mortars, mortars for masonry and plastering.

#### UNIT-IV

##### **Stones:**

Classification, requirements of good structural stone, quarrying, blasting and sorting out of stones, dressing, sawing and polishing, prevention and seasoning of stone.

##### **Timber:**

Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, plywood, fiberboard, masonite and its manufacturing, important Indian timbers.

##### **Paints and Varnishes:**

Basic constituents of paints, types of paints, painting of wood, constituents of varnishes, characteristics and types of varnishes.

##### **Text Books**

1. Building Construction and Material, Gurcharan Singh, Standard Book House
2. Building Material and Construction, G.C.Sahu & Joygopal Jena, McGeraw Hill Education(India) Private Limited, Chennai.
3. Building Construction, Dr. B.C.Punmia, Luxmi Publication
4. Building Construction, Sushil Kumar, Standard Pub., N. Delhi

##### **Reference Books**

1. Building Material, Rangawala
2. Construction Engineering, Y.S. Sane
3. Building Construction, Gurcharan Singh, Standard Pub., N. Delhi

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B. Tech (3 <sup>rd</sup> Semester) Civil Engineering								
CE-213 LA	Fluid Mechanics Lab							
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Practical	Total	Time (Hrs)
0	0	2	1	0	40	60	100	3

#### List of experiments

1. To determine metacentric height of the ship model.
2. To verify the Bernoulli's theorem.
3. To determine coefficient of discharge for an Orifice meter.
- 4 To determine coefficient of discharge of a venturimeter.
- 5 To determine the various hydraulic coefficients of an Orifice (Cd, Cc, Cv).
- 6 To determine coefficient of discharge for an Orifice under variable head.
- 7 To calibrate a given notch.
- 8 To determine coefficient of discharge for a mouth piece.
- 9 Drawing of a flow net by Viscous Analogy Model and Sand Box Model.
- 10 To study development of boundary layer over a flat plate.
- 11 To study velocity distribution in a rectangular open channel.
- 12 Velocity measurements by current meter, float, and double float (demonstration only)
- 13 Experiment on Vortex formation (demonstration only).

W.e.f. Session 2019-20

B. Tech (3 <sup>rd</sup> Semester) Civil Engineering								
CE-215 LA Surveying & Geomatics Lab								
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Practical	Total	Time (Hrs.)
0	0	2	1	0	40	60	100	3

**List of Experiments:**

1. To plot a traverse of a given area by chain surveying & also locate offsets
2. To plot a traverse of a given area with the help of a compass and a chain.
3. To work out relative elevations of various points on the grounds by performing profile or by fly leveling
4. To plot a longitudinal section and cross section of given alignment.
5. To determine the difference in elevations of two points by reciprocal leveling.
6. To plot a contour map of given area.
7. To determine the position of station occupied by plane table using three point problem.
8. To determine the position of station occupied by plane table using two point problem.
9. Use of a tangent clinometer with plane table.

W.e.f. Session 2019-20

B. Tech (3 <sup>rd</sup> Semester) Civil Engineering								
CE-217 LA Computer-aided Civil Engineering Drawing								
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Practical	Total	Time (Hrs.)
0	0	2	--	--	40	60	100	3

#### LIST OF EXPERIMENTS

##### Typical drawings of:

Bonds in brick work

Grillage foundation

##### Preparation of building drawing mentioning its salient features including the following details:

Ground floor plan

Two Sectional Elevations

Front and Side Elevations

Plan and Sectional Elevation of stair case, doors/ windows/ ventilators, floor and roof.

Footings: Isolated footings, combined footings, rectangular, trapezoidal, strip, strap, raft footings

RCC Flat slabs

Masonry columns, bearing walls, retaining walls.

W.e.f. Session 2019-20

MC-901A	Environmental Sciences						
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	0	75	25	100	3 Hrs.
<b>Purpose</b>	To learn the multidisciplinary nature, scope and importance of Environmental sciences.						
<b>Course Outcomes (CO)</b>							
<b>CO1</b>	The students will be able to learn the importance of natural resources.						
<b>CO2</b>	To learn the theoretical and practical aspects of eco system.						
<b>CO3</b>	Will be able to learn the basic concepts of conservation of biodiversity.						
<b>CO4</b>	The students will be able to understand the basic concept of sustainable development.						

#### UNIT 1

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.

- Forest Resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water Resources: Use & over-utilization of surface & ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food Resources: World Food Problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- Energy Resources: Growing energy needs, renewable & non-renewable energy sources, use of alternate energy sources. Case studies.
- 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 lifestyle.

#### UNIT II

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

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

#### UNIT III

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

**Environmental Pollution Definition:** Cause, effects and control measures of (a) Air Pollution (b) Water Pollution (c) Soil Pollution (d) Marine Pollution (e) Noise Pollution (f) Thermal Pollution (g) Nuclear Hazards

Solid waste management- cause, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides

#### UNIT IV

**Social Issues and the Environment.** From unsustainable to sustainable development, Urban problems 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, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public Awareness, Human population and the Environment, Population growth, variation among nations, Population explosion-Family Welfare Programme, Environment and human health. Human rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human Health, Case Studies, Drugs and their effects; Useful and harmful drugs, Use and abuse of drugs, Stimulant and depressant drugs, Concept of drug de-addiction, Legal position on drugs and laws related to drugs.

#### Suggested Books

- Environmental Studies- Deswal and Deswal. Dhanpat Rai and Co.
- Environmental Science and Engineering Anandan, P. and Kumaravelan, R. 2009. Scitech Publications (India) Pvt. Ltd., India.
- Environmental Studies. Daniels Ranjit R. J. and Krishnaswamy. 2013. Wiley India.
- Environmental Science- Botkin and Keller. 2012. Wiley, India

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B.Tech. (4 <sup>th</sup> Semester) Civil Engineering							
Civil Engineering- Societal & Global Impact							
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
2	0	0	2	75	25	100	3

#### UNIT-I

**Introduction to Course and Overview;** 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, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming, its impact and possible causes; Evaluating future requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis.

#### UNIT-II

**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

**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;

#### UNIT-III

**Environment, Traditional & futuristic methods:-** Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Stationarity and nonstationarity; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability.

**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

#### UNIT-IV

**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 developmen.

#### Text/Reference Books:

1. Žiga Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht
2. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition
3. NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.
4. Allen M. (2008) Cleansing the city. Ohio University Press. Athens Ohio.
5. Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). London Tideway Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options
6. <http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx>

**Note: The paper setter will set the paper as per the question paper templates provided.**

B. Tech (4 <sup>th</sup> Semester) Civil Engineering							
ES-205A	Engineering Mechanics						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs)
3	0	0	3	75	25	100	3

#### UNIT-I

**Introduction to Engineering Mechanics** 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 In-determinacy.

**Friction:-** Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.

#### UNIT-II

**Basic Structural Analysis:-** 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:-** Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

#### UNIT-III

**Virtual Work and Energy Method-** Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

**Review of particle dynamics-** Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse momentum (linear, angular); Impact (Direct and oblique).

#### UNIT-IV

**Introduction to Kinetics of Rigid Bodies:-** Basic terms, general principles in dynamics; Types of motion, Instantaneous centre 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.

#### **Text/Reference Books:**

1. A.K. Dhiman, P. Dhiman & D.C. Dhiman (2015), Engineering Mechanics, McGraw Hill Education (India) Private Limited, Chennai.
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R. C. Hibler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shames and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education
7. Reddy Vijaykumar K. and K. Suresh Kumar (2010), Singer's Engineering Mechanics
8. Bansal R.K. (2010), A Text Book of Engineering Mechanics, Laxmi Publications
9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

**Note: The paper setter will set the paper as per the question paper templates provided.**

B.Tech. (4 <sup>th</sup> Semester) Civil Engineering							
CE-204A	Design of Steel Structure-I						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time(Hrs)
3	1	0	4	75	25	100	3

#### UNIT-I

##### Introduction:

Loads, structural steels and their specifications, structural elements, steel vs. concrete and timber, design specifications as per IS: 800, structural layout, strength and stiffness considerations, efficiency of cross-section, safety and serviceability considerations.

##### Riveted/Bolted Connections:

Riveting and bolting, their types, failure of riveted joint, efficiency of a joint, design of riveted joint, concentric riveted joints, advantages and disadvantages of bolted connections, stresses in bolts.

##### Welded Connections:

Types of welded joints, design of welded joint subjected to axial loads, welded joints subjected to eccentric loads, simple, semi-rigid and rigid connections.

##### Design of Tension Members:

Introduction, types of tension members, net sectional areas, design of tension members, lug angles and splices.

#### UNIT-II

##### Design of Compression Members:

Introduction, effective length and slenderness ratio, various types of sections used for columns, built up columns, necessity, design of built up columns, laced and battened columns including the design of lacing and battens, design of eccentrically loaded compression members.

##### Column Bases and Footings:

Introduction, types of column bases, design of slab base and gusseted base, design of gusseted base subjected to eccentrically loading, design of grillage foundations.

#### UNIT-III

##### Design of Beams:

Introduction, types of sections, general design criteria for beams, design of laterally supported and unsupported beams, design of built up beams, web buckling, web crippling and diagonal buckling.

#### UNIT-IV

##### Gantry Girders:

Introduction, various loads, specifications, design of gantry girder.

##### Plate Girder:

Introduction, elements of plate girder, design steps of a plate girder, necessity of stiffeners in plate girder, various types of stiffeners, web and flange splices (brief introduction), Curtailment of flange plates, design beam to column connections: Introduction, design of framed and seat connection.

##### DRAWINGS (For Practice Purpose only)

1. Structural drawings of various types of welded connections (simple and eccentric)
2. Beam to column connections (framed & seat connections)
3. Column bases- slab base, gusseted base and grillage foundation.
4. Plate girder.
5. Roof truss.

##### Text Books

- 1) Design of steel structures, S.K.Duggal, TMH Pub., New Delhi
- 2) Design of steel structures, Dr.B.C.Punmia, Luxmi Publication
- 3) Design of steel structures-I, Dr. Ram Chandra, Scientific Publisher, Jodhpur

##### Reference Books

- 1) Design of steel structures, A.S.Arya & J.L.Ajmani, Nem chand & Bros., Roorkee.
- 2) Design of steel structures, M.Raghupati, TMH Pub., New Delhi.
- 3) Design of steel structures, S.M.A.Kazmi & S.K.Jindal, Prentice Hall, New Delhi.

**Note: The paper setter will set the paper as per the question paper templates provided.**

B.Tech. (4 <sup>th</sup> Semester) Civil Engineering							
CE-202A	Structural Analysis-I						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time
3	1	0	4	75	25	100	3

#### UNIT-I

##### Statically Indeterminate Structures:

Introduction, Static and Kinematic Indeterminacies, Castigliano's theorems, Strain energy method, Analysis of frames with one or two redundant members using Castigliano's 2nd theorem.

#### UNIT-II

##### Slope deflection and moment Distribution Methods:

Analysis of continuous beams & portal frames, Portal frames with inclined members.

#### UNIT-III

##### Column Analogy Method:

Elastic centre, Properties of analogous column, Applications to beam & frames.

##### Analysis of Two hinged Arches:

Parabolic and circular Arches, Bending Moment Diagram for various loadings, Temperature effects, Rib shortening, Axial thrust and Radial Shear force diagrams.

#### UNIT-IV

##### Unsymmetrical Bending

Introduction Centroidal principal axes of sections, Bending stresses in beam subjected to unsymmetrical bending, shear centre, shear centre for channel, Angles and Z sections.

##### Cable and suspension Bridges:

Introduction, uniformly loaded cables, Temperature stresses, three hinged stiffening Girder and two hinged stiffening Girder.

##### Text Books

- 4) Structural Analysis-II, Bhavikatti S.S., Vikas Pub.House, N.Delhi.
- 5) Theory of Structures, S.Ramamrutham, DPR publishing Company
- 6) Theory of Structures, B.C.Punmia, Luxmi Publication

##### Reference Books

- 1) Statically Indeterminate Structures, C.K. Wang, McGraw Hill Book Co., New York.
- 2) Advanced Structural Analysis, A.K. Jain, Nem Chand & Bros., Roorkee.
- 3) Indeterminate Structures, R.L. Jindal, S. Chand & Co., New Delhi.
- 4) Theory of Structures, Vol. I, S.P. Gupta & G.S.Pandit, Tata McGraw Hill, New Delhi

**Note: The paper setter will set the paper as per the question paper templates provided.**



B.Tech. (4 <sup>th</sup> Semester) Civil Engineering							
CE-206A Soil Mechanics							
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time(Hrs)
3	0	0	3	25	75	100	3

#### UNIT-I

##### Soil Formation and Composition

Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, major soil deposits of India, particle size, particle shape, interparticle forces, soil structure, principal clay minerals.

##### Basic Soil Properties

Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate properties, grain size analysis, sieve analysis, sedimentation analysis, grain size distribution curves, consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.

##### Classification of soils

Purpose of classification, classification on the basis of grain size, classification on the basis of plasticity, plasticity chart, Indian Standard Classification System.

##### Permeability of Soils

Introduction, Darcy's law and its validity, discharge velocity and seepage velocity, factors affecting permeability, laboratory determination of coefficient of permeability, determination of field permeability, permeability of stratified deposits.

#### UNIT-II

##### Effective Stress Concept

Principle of effective stress, effective stress under hydrostatic conditions, capillary rise in soils, effective stress in the zone of capillary rise, effective stress under steady state hydro-dynamic conditions, seepage force, quick condition, critical hydraulic gradient, two dimensional flow, Laplace's equation, properties and utilities of flownet, graphical method of construction of flownets, piping, protective filter.

##### Compaction

Introduction, role of moisture and compactive effect in compaction, laboratory determination of optimum moisture content, moisture density relationship, compaction in field, compaction of cohesionless soils, moderately cohesive soils and clays, field control of compaction.

#### UNIT-III

##### Vertical Stress below Applied Loads

Introduction, Boussinesq's equation, vertical stress distribution diagrams, vertical stress beneath loaded areas, Newmark's influence chart, approximate stress distribution methods for loaded areas, Westergaard's analysis, contact pressure.

##### Compressibility and Consolidation

Introduction, components of total settlement, consolidation process, one-dimensional consolidation test, typical void ratio-pressure relationships for sands and clays, normally consolidated and over consolidated clays, Casagrande's graphical method of estimating pre-consolidation pressure, Terzaghi's theory of one-dimensional primary consolidation, determination of coefficients of consolidation, consolidation settlement, Construction period settlement, secondary consolidation.

#### UNIT-IV

##### Shear Strength

Introduction, Mohr stress circle, Mohr-Coulomb failure-criterion, relationship between principal stresses at failure, shear tests, direct shear test, unconfined compression test, triaxial compression tests, drainage conditions and strength parameters, Vane shear test, shear strength characteristics of sands, normally consolidated clays, over-consolidated clays and partially saturated soils, sensitivity and thixotropy.

##### Earth Pressure

Introduction, earth pressure at rest, Rankine's active & passive states of plastic equilibrium, Rankine's earth pressure theory Coulomb's earth pressure theory, Culmann's graphical construction, Rebhann's construction.

##### Text Books

1. Soil Mechanics and Foundation Engineering by Dr. K.R.Arora
2. Soil Mechanics and Foundations, Dr.B.C.Punmia, Luxmi Publication
3. Basic and Applied Soil Mechanics by Gopal Ranjan, ASR Rao, New Age International(P)Ltd. Pub.N.Delhi

##### Reference Books

1. Soil Engg. in Theory and Practice, Vol .I, Fundamentals and General Principles by Alam Singh, CBS Pub.,N.Delhi.
2. Engg.Properties of Soils by S.K.Gulati, Tata-Mcgraw Hill N Delhi.
3. Geotechnical Engg. by P.Purshotam Raj,Tata Mcgraw Hill.
4. Principles of Geotechnical Engineering by B.M.Das, PWS KENT, Boston.

**Note: The paper setter will set the paper as per the question paper templates provided.**

B. Tech (4th Semester) Civil Engineering							
CE-208A	Hydraulic Engineering						
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs)
3	0	0	3	75	25	100	3

### UNIT-I

#### Laminar Flow:

Navier Stoke's equation, Laminar flow between parallel plates, Couette flow, laminar flow through pipes-Hagen Poiseuille law, laminar flow around a sphere-Stokes'law.

Flow through pipes:

Types of flows-Reynold's experiment, shear stress on turbulent flow, boundary layer in pipes-Establishment of flow, velocity distribution for turbulent flow in smooth and rough pipes, resistance to flow of fluid in smooth and rough pipes, Stanton and Moody's diagram. Darcy's weisbach equation, other energy losses in pipes, loss due to sudden expansion, hydraulic gradient and total energy lines, pipes in series and in parallel, equivalent pipe, branched pipe, pipe networks, Hardy Cross method, water hammer.

### UNIT-II

#### Drag and Lift:

Types of drag, drag on a sphere, flat plate, cylinder and airfoil, development of lift on immersed bodies like circular cylinder and airfoil.

Open Channel Flow:

Type of flow in open channels, geometric parameters of channel section, uniform flow, most economical section (rectangular and trapezoidal), specific energy and critical depth, momentum in open channel, specific force, critical flow in rectangular channel, applications of specific energy and discharge diagrams to channel transition, metering flumes, hydraulic jump in rectangular channel, surges in open channels, positive and negative surges, gradually varied flow equation and its integration, surface profiles.

### UNIT-III

#### Compressible flow:

Basic relationship of thermodynamics continuity, momentum and energy equations, propagation of elastic waves due to compression of fluid, Mach number and its significance, subsonic and supersonic flows, propagation of elastic wave due to disturbance in fluid mach cone, stagnation pressure.

### UNIT-IV

#### Pumps and Turbines:

Reciprocating pumps, their types, work done by single and double acting pumps. Centrifugal pumps, components and parts and working, types, heads of a pump-statics and manometric heads,. Force executed by fluid jet on stationary and moving flat vanes, Turbines-classifications of turbines based on head and specific speed, component and working of Pelton wheel and Francis turbines, cavitation and setting of turbines.

Paper Setter's Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

#### Text Books

1. Hydraulic and Fluid Mechanics by P.N.Modi & S.M.Seth
2. Fluid Mechanics and Hydraulic Machines, Dr. R.K.Bansal, Luxmi Publication

#### Reference Books

1. Flow in Open Channels by S.Subraminayam
2. Introduction to Fluid Mechanics by Robert N.Fox & Alan T.Macnold

B.Tech. (4 <sup>th</sup> Semester) Civil Engineering								
CE-212LA Structural Analysis-I Lab								
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Practical	Total	Time
0	0	2	1	0	40	60	100	2

#### LIST OF EXPERIMENTS

1. Verification of reciprocal theorem of deflection using a simply supported beam.
2. Verification of moment area theorem for slopes and deflections of the beam.
3. Deflections of a truss- horizontal deflection & vertical deflection of various joints of a pin- jointed truss.
4. Elastic displacements (vertical & horizontal) of curved members.
5. Experimental and analytical study of 3 hinged arch and influence line for horizontal thrust.
6. Experimental and analytical study of behavior of struts with various end conditions.
7. To determine elastic properties of a beam.
8. Uniaxial tension test for steel (plain & deformed bars)
9. Uniaxial compression test on concrete & bricks specimens.

W.e.f. Session 2019-20

B.Tech. (4 <sup>th</sup> Semester) Civil Engineering								
CE-216LA	Soil Mechanics Lab							
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Practical	Total	Time
0	0	2	1	0	40	60	100	2

**List of Experiments:**

1. Visual Soil Classification and water content determination.
2. Determination of specific gravity of soil solids.
3. Grain size analysis-sieve analysis.
4. Liquid limit and plastic limit determination.
5. Field density by:  
Sand replacement method  
Core cutter method
6. Proctor's compaction test.
7. Coefficient of permeability of soils.
8. Unconfined compressive strength test.
9. Direct shear test on granular soil sample.
10. Unconsolidated undrained (UU) triaxial shear test of fine grained soil sample.

**Note:** At least ten experiments are required to be performed by students from the above list and two may be performed from the experiments developed by the institute.

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<b>B. Tech. (4<sup>th</sup> Semester) Civil Engineering</b>							
<b>CE-218A</b>	<b>Hydraulics Engineering lab</b>						
<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>	<b>Credits</b>	<b>Major Test</b>	<b>Minor Test</b>	<b>Total</b>	<b>Time (Hrs.)</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>75</b>	<b>25</b>	<b>100</b>	<b>3</b>

- 1 To determine the coefficient of drag by Stoke's law for spherical bodies.
- 2 To study the phenomenon of cavitation in pipe flow.
- 3 To determine the critical Reynold's number for flow through commercial pipes.
- 4 To determine the coefficient of discharge for flow over a broad crested weir.
- 5 To study the characteristics of a hydraulic jump on a horizontal floor and sloping glacis including friction blocks.
- 6 To study the scouring phenomenon around a bridge pier model.
- 7 To study the scouring phenomenon for flow past a spur.
- 8 To determine the characteristics of a centrifugal pump.
- 9 To study the momentum characteristics of a given jet.
- 10 To determine head loss due to various pipe fittings.

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