

Bachelor of Technology (CIVIL Engineering), KUK
SCHEME OF STUDIES/EXAMINATIONS (Modified)
(Semester -IV) Credit-Based (w.e.f. 2021-22)

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	HTM-901A	Universal Human Values II : Understanding Harmony	3:0:0	3	3	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	3:0:0	3	3	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	

HTM-901A Universal Human Values II: Understanding Harmony							
Lecture	Tutorial	Practical	Credit	Major Test	Minor Test	Total	Time
3	0	0	3.0	75	25	100	3 Hours
Purpose	Purpose and motivation for the course, recapitulation from Universal Human Values-I						
Course Outcomes(CO)							
CO1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.						
CO2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.						
CO3	Strengthening of self-reflection.						
CO4	Development of commitment and courage to act.						

Module 1: Course Introduction-Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
 2. Self-Exploration—what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation-as the process for self-exploration
 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
 4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
 6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.
- Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than an arbitrary choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being- Harmony in Myself!

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
 8. Understanding the needs of Self(‘I’) and ‘Body’ –happiness and physical facility
 9. Understanding the Body as an instrument of ‘I’(I being the doer, seer and enjoyer)
 10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
 11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
 12. Programs to ensure Sanyam and Health.
- Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness(trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc .Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module4:UnderstandingHarmonyintheNatureandExistence-WholeexistenceasCoexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfillment on the four orders of nature- recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module5: ImplicationsoftheaboveHolisticUnderstandingofHarmonyonProfessionalEthics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a .At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching in situations and organizations
28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg.to discuss the conduct as an engineer or scientist etc.

READINGS:

TextBook

1. Human Values and Professional Ethics by RRGaur, RSangal, GP Bagaria, Excel Books, New Delhi,2010

ReferenceBooks

1. JeevanVidya:EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak,1999.
2. HumanValues,A.N.Tripathi,NewAgeIntl.Publishers,NewDelhi,2004.
3. TheStoryofStuff(Book).
4. TheStoryofMyExperimentswithTruth-byMohandas KaramchandGandhi
5. SmallisBeautiful-E.FSchumacher.
6. SlowisBeautiful-CecileAndrews
7. EconomyofPermanence-JCKumarappa
8. BharatMeinAngrejiRaj-PanditSunderlal
9. RediscoveringIndia -byDharampal
10. HindSwarajor IndianHomeRule-byMohandas K.Gandhi
11. IndiaWinsFreedom-MaulanaAbdulKalamAzad
12. Vivekananda-RomainRolland(English)
13. Gandhi-RomainRolland(English)

MODEOFCONDUCT

Lecture hours are to be used for lecture/practice sessions.

Lectures hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Practice hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important to critical elements.

In the discussions, particularly during practice sessions, the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration. Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Practice experiments are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses.

This course is to be taught by faculty from every teaching department, including HSS faculty. Teacher preparation with a minimum exposure to at least one 8-day FDP on Universal Human Values is deemed essential.

ASSESSMENT:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation.

Example:

Assessment by

faculty mentor: 5 marks

Self-assessment: 5 marks

Assessment by peers: 5 marks

Socially relevant project/Group Activities/Assignments: 10 marks

Semester End Examination: 75 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

B. Tech (4 th 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, McGeraw 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. Shanes 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 th 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 th 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 th 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 th 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 th Semester) Civil Engineering								
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.

W.e.f. Session 2019-20

B. Tech. (4 th Semester) Civil Engineering							
Hydraulics Engineering lab							
Lecture	Tutorial	Practical	Credits	Major Test	Minor Test	Total	Time (Hrs.)
3	0	0	3	75	25	100	3

- 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.

W.e.f. Session 2019-20