SHRI SHANKARACHARYA TECHNICAL CAMPUS, BHILAI

(An Autonomous Institute affiliated to CSVTU, Bhilai)

SCHEME OF TEACHING AND EXAMINATION (Effective from 2020-2021 Batch)

B.Tech. (Civil Engineering) Fourth Semester

S. No.	Board of Studies(BOS)	Courses (Subject)	CourseCode	Period per Week			Scheme of Examination			Total Marks	Credit
							Theory/Lab				
				L	T	P	ESE	CT	TA		
1.	Civil Engg.	Structural Analysis-I	CE101401	3	1	-	100	20	30	150	4
2.	Civil Engg.	Building Planning and Construction Drawing	CE101402	2	1	-	100	20	30	150	3
3.	Civil Engg.	Surveying And Geomatics	CE101403	3	-	-	100	20	30	150	3
4.	Civil Engg.	Hydraulic Engineering	CE101404	3	-	-	100	20	30	150	3
5.	Civil Engg.	Transportation Engineering-I	CE101405	3	-	-	100	20	30	150	3
6.	Civil Engg.	Building Drawing Lab	CE101491	-	-	2	25	-	25	50	1
7.	Civil Engg.	Surveying and Geomatics Lab	CE101492	-	-	2	25	-	25	50	1
8.	Civil Engg.	Hydraulic Lab	CE101493	-	-	2	25	-	25	50	1
9.	Civil Engg.	Engineering Geology Lab/ Mini Project – II	CE101494	-	-	2	50	-	25	75	1
10.	Chemistry	Biology for Engineers	AC100495	-	-	-	-	-	25	25	-
Total				**14**	**2**	**8**	**625**	**100**	**275**	**1000**	**20**

Note:

(a) Abbreviations used : L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Exam, CT- Class Test, TA- Teacher's Assessment

(b)The duration of end semester examination of all theory papers will be of three hours.

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SYLLABUS

B.Tech. (Civil Engineering) Fourth Semester

Subject Code: CE101401	STRUCTURAL ANALYSIS-I	L = 3	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	25	25	150	3 Hours

Course Objectives	Course Outcomes
Course Objectives: • Make student to understand between Determinate and Indeterminate structures. • To understand the methods to analyse slopes and deflections of structures. • To understand the method of Strain Energy to analyse deflections of structures. • To provide an understanding about loads position variation on structures and corresponding analysis by rolling loads and ILDs. • To understand behaviour of suspension bridges, cables and Arches.	**On successful completion of the course, the student will be able to:** CO1: To be able to find out indeterminacies of structures and be capable of differentiating the structures. CO2: To be able to find out and apply suitable method for analysis of structures to evaluate displacements. CO3: To be capable of applying strain energy method to find displacements of determinate structures. CO4: To be able to draw Influence Line Diagram for functions such as reactions at the supports, bending moment and shear force at a section and capable of evaluating maximum values of these functions for various load positions. CO5: To be able to analyze suspension bridges and arches.

UNIT – I: **CO-1**

Determinate Structures - Determinate vs. Indeterminate structures, Plane frames and Space frames, Static Indeterminacy - External and Internal Indeterminacy of rigid and pin jointed frames, Degree of freedom per node, Kinematic indeterminacy, Rules for determining degree of indeterminacy, Analysis of simple and determinate space trusses. Method of tension coefficient for pin jointed space truss. **[7 Hrs]**

UNIT – II: **CO-2**

Deflection and Slope - Moment curvature relation, The elastic curve, Relation between Loading, SF, BM, Slope and Deflection, Deflection and slopes of statically determinate beams by Double integration method, Macaulay' s method, Moment - Area method and Conjugate beam method. **[8 Hrs]**

UNIT – III: **CO-3**

Strain Energy - Strain energy due to axial load, bending, Shear and Torsion, Castigliano's theorem for deflection and rotation, Betti's theorem, Maxwell's law of reciprocal deflections, Strain energy method for determination of slope and deflection of statically determinate beams, Pin-joined trusses and rigid frames, Unit load method. **[7 Hrs]**

UNIT – IV: **CO-4**

Rolling Loads & Influence Lines - Introduction to Rolling loads, Concept of influence lines, Influence lines for reaction, Shear force and Bending moment in simply supported beams, Analysis for different types of rolling loads - single concentrated load, several concentrated loads, Uniformly distributed load shorter and longer than the span, Absolute maximum bending moment and shear force, Influence lines for linear system, Influence lines for forces in trusses. **[7 Hrs]**

UNIT – V: **CO-5**

Cables, Suspension bridges & arches - Analysis of forces in cables with concentrated and continuous loadings, Suspension bridges with three-hinged stiffening girders. Theory of arches - Eddy's theorem, Analysis of three-hinged arches. **[7 Hrs]**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Basic Structural Analysis (Vol. I & II)	Bhavikatti S.S	-	Vikas Publishing
2	Theory of Structures	Dr. B. C. Punmia, Jain & Jain	-	Laxmi Publications

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Theory & Analysis of Structures (Vol. — I & II)	Jain, O.P. and Jain B.K	-	Jain, O.P. and Jain B.K.
2	Structural Analysis	R.C. Hibber	-	Pearson Publication
3	Structural Analysis	Ghali, A. & Neville, M.	-	Chapman & Hall Publication
4	Elementary Structural Analysis	Willbur and Norris	-	Willbur and Norris
5	Structural Analysis	Negi LS. &Jangid R.S.	-	Tata McGraw Hill
6	Theory of Structures	Ramamurtham S. & Narayan R	-	DhanpatRai Publications

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SYLLABUS

B.Tech. (Civil Engineering) Fourth Semester

Subject Code CE101402	BUILDING PLANNING AND CONSTRUCTION DRAWING	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	25	25	150	4 Hours

Course Objectives	Course Outcomes
Course Objectives: • Make student to understand General Principles of planning. • To understand the drawing of plan of single, double story residential buildings, Layout plan of septic tank water supplies and foundation plan • To understand the Drawing of section of single and double story residential buildings • To provide an understanding drawing of elevation of building. Study and importance of stair case. • To understand detailing of flush shutter, panelled shutter etc. Modification in existing building.	**On successful completion of the course, the student will be able to:** CO1: Students are expected to understand various methods of general principles of planning. CO2: Students are expected to understand drawing plan, layout plan of single, double story residential buildings, foundation, floors, roof, ceiling. CO3: Students are expected to understand drawing of elevation & section of single & double story buildings CO4: Students are expected to understand doors and windows and elements of perspective. CO5: Students are expected to understand building construction works.

UNIT – I: **CO-1**

General Principles of planning - Aspects, Prospects, Circulation, Grouping, Roominess, Sanitation, Economy, Elegance, Furniture requirements, flexibility, Privacy. Site selection and requirements of different public buildings such as hospitals, schools, hostels using line plan. Municipal regulations and bye-laws for residential buildings. **[8 Hrs]**

UNIT – II: **CO-2**

Drawing of plan of single, double story residential buildings and hostels, single line plan of primary health centre, school, canteen for given site requirements. Foundation plan, Layout plan. Brief of floors, roof & ceilings. **[7 Hrs]**

UNIT – III: **CO-3**

Drawing of elevation & section of single and double story residential buildings, primary health centre, school, hostel, canteen for given site requirements. **[7Hrs]**

UNIT – IV: **CO-4**

Detailing of flush shutter, panelled shutter, fully glazed, half glazed, half glazed and half panelled doors and windows, example on simple blocks, Elements of perspective. **[7Hrs]**

UNIT – V: **CO-5**

Masonry - Technical terms in masonry, Stone & Brick masonry, Damp proofing, plastering & pointing. Stairs Types based on geometry and material, suitability, proportioning and Drawing of stairs, lifts and escalators, Methods of constructions. **[7Hrs]**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	A course in Civil Engineering Drawing	V.B. Sikka	3rd Edition 2017	Katson Technical Publications)
2	Civil Engineering Drawing	Shah, Kala and Patk	5th edition	(Tata McGraw Hill)
3	Building Construction	B.C. Punmia	8th edition	(Laxmi Publication Pvt. Ltd.)

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	A Textbook of Civil Engineering Drawing: Buildings	R.P. Chandel	9th Edition	(Katson Technical Publications)
2	Planning and Designing Buildings	Y.S. Sane	1st edition	(Allies Book Stall and Engineering Book Publishing Co.)
3	Hospitals: Planning, Design and Management	Kunders, Gopinath & Ashoka Katakam	2003 Edition	(Tata McGraw Hill)
4	A Book of Home Plans	D. N. Ghose	2nd edition	(CBS Publishers and Distributors)
5	Building Construction	S. C. Rangwala	4th edition	Charotar Publishing House, Anand, Gujarat

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SYLLABUS

B.Tech. (Civil Engineering) Fourth Semester

Subject Code: CE101403	SURVEYING & GEOMATICS	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	25	25	150	3 Hours

Course Objectives	Course Outcomes
Course Objectives: • To be familiar with various aspects of Trilateration and Triangulation. • To deal with the relevant computations, errors and observations. • To gain the knowledge of Tachometry, various systems, instruments etc. • To learn the concepts of Photographic and aerial surveying. • To learn and apply the concept of Hydrographic surveying.	**On successful completion of the course, the student will be able to:** CO1: Deal with the various aspects of Trilateration and Triangulation. CO2: Do the relevant computations, errors and observations. CO3: Gain and apply the knowledge of Tacheometery, various modern survey instruments. CO4: Apply the concepts of Photographic and aerial surveying and GPS. CO5: Efficiently deal with the Hydrographic surveying.

UNIT – I: Trilateration and Triangulation **CO-1**

Principle of Trilateration, Principle and classification of Triangulation System, Triangulation chains, Station marks and Signals, Satellite station, intersected and Resected points, field work-Reconnaissance, Inter-visibility of station, Angular measurement, Base line measurement. **[8Hrs]**

UNIT – II: Adjustment Computations **CO-2**

Weighting of observations, Treatment of random errors, probability equation, Normal law of error, Most Probable Value, Propagation of errors and variances. Most probable value, Principle of Least square, Observations and correlatives, Normal Equations. Adjustment of triangulation figures. **[7Hrs]**

UNIT – III: Tacheometery **CO-3**

Definitions, Principles of stadia systems. Instrument constants, Subtense and Tangential Systems. Construction and use of Reduction Tacheometers, Range Finders, EDM instruments, Total Station and their uses. Study of Laser Distance Meter. **[7Hrs]**

UNIT – IV: Photographic and aerial surveying **CO-4**

Photo theodolite, principle of the method of terrestrial photogrammetry, aerial surveying, scale and distortion of the vertical and tilted photograph, comparison between air photograph and map, Study of GPS, GIS and Remote Sensing. **[7Hrs]**

UNIT – V: **Hydrographic surveying** **CO-5**

Introduction, shore line survey, soundings methods, gauges, equipment required for hydrographic surveying, sounding party, methods of locating soundings, reduction of soundings and plotting of soundings, problems related to hydrographic surveying . **[7Hrs]**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Surveying Vol. I & II)	Punmia, B.C.	16TH Edition 1996	Laxmi Publications, New Delhi
2	Surveying (Vol. II & III)	Agor, R.	11TH Edition 2012	Khanna publications, Delhi
3	Surveying (Vol. I & II)	C. Venkataramaih	2ND Edition	Universities Press Hyderabad
4	Surveying (Vol. II)	S.K. Duggal	4TH Edition	McGraw Hill Publications

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Surveying (Vol. II & III)	Arora, K.R.	12TH Edition	Standard Book House, Delhi
2	Engineering Surveying Technology	Kennie, T.J.M. and Petrie G	1990	Blackie & Sons Pvt. Ltd., London
3	An Introduction to Remote Sensing and its Applications	Shivangi Somvanshi, Maya Kumari	1st Edition	S.K. Kataria and Sons, New Delhi
4	Surveying (Vol. I & II)	Kanetkar T.P.	15st Edition	Pune Vidyarthi Griha Prakashan, Pune

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SYLLABUS

B.Tech. (Civil Engineering) Fourth Semester

Subject Code: CE101404	Hydraulic Engineering	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	25	25	150	3 Hours

Course Objectives	Course Outcomes
Course Objectives: • Be familiar with different fluid flowing condition in pipe. • Determination of hydraulic parameters affecting flow of fluids by various Methods. • Learning different effects of pipe flow and their respective analysis. • Be familiar with hydraulic machines which have extensive application in Water Supply Civil Engineering Construction projects.	**On successful completion of the course, the student will be able to:** CO1: Analyse turbulent flow in pipe and solve problems of pipe network. CO2: Analyse Boundary layer and calculate drag and lift. CO3: Analyse flow in open channel. CO4: Apply the Dimensional analysis for fluid flow problem. CO5: Analyse the flow in Turbine & Pumps.

UNIT – I: **CO-1**

Turbulent flow in pipe- Nature of turbulence, free and wall turbulence, turbulent flow in pipes, equation for velocity distribution over smooth and rough surfaces, energy and momentum correction factor, Resistance coefficient (Friction factor) and its variation, Colebrook-White equation, Moody's diagram, Explicit equation for friction factors, concept of equivalent length, pipes in series and parallel, Analysis of pipe network (Hardy-Cross method). **[8 Hrs]**

UNIT – II: **CO-2**

Boundary layer Analysis- Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, and laminar sub layer, Application of momentum equation, local and average friction coefficient. Fluid flow past submerged bodies Drag and lift drag on sphere, cylinder and disc, Magnus effect. **[7 Hrs]**

UNIT – III: **CO-3**

Non-uniform flow in open channel- Specific energy, critical flow, analysis of flow over hump and transition, equation of gradually varied flow, hydraulic jump and evaluation of its elements in rectangular channel. **[7 Hrs]**

UNIT – IV: **CO-4**

Compressibility effect in pipe flow-Transmission of pressure waves in rigid and elastic pipes, water hammer, **Dimensional analysis and Hydraulic similitude -** Dimensional analysis, Buckingham's theorem, important dimensionless numbers and their significances, geometric, kinematics and dynamic similarity, model study. **[7 Hrs]**

UNIT – V: **CO-5**

Hydraulic Machines– Turbines: Classification of turbines, draft tube, specific speed, unit quantities, and characteristics curves of turbines, and governing of turbine. **Pump**: Classification of pumps, types, efficiencies, specific speed, selection, cavitations, characteristic curves. **[7 Hrs]**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Fluid Mechanics and Machines	Dr. R.K. Bansal	10th Edition	Laxmi Publications
2	Fluid Mechanics	Dr. P.N. Modi	22nd Edition	Standard Book House
3	Fluid Mechanics and Machines	Dr. A.K. Jain	12th Edition	John Wiley & Sons

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Mechanics of Fluid	Irving H. Shames	4th Edition	McGraw Hill
2	Introduction to Fluid Mechanics	James A. Fay		Prentice Hall India
3	Fluid Mechanics	R.J. Garde	2nd Edition	New Age International Publication
4	Fluid Mechanics	Streeter V.L. & Wylie E.B.	6th Edition	Tata McGraw Hills

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SYLLABUS

B.Tech. (Civil Engineering) Fourth Semester

Subject Code: CE101405	Transportation Engineering-I	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	25	25	150	3 Hours

Course Objectives	Course Outcomes
Course Objectives: • Be familiar with principles of Highway planning & Geometric design. • Fundamental Concepts of Traffic Engineering. • Learning different highway materials & their testing. • Learning pavement design & its Construction. • Learning different aspect of Airport planning.	**On successful completion of the course, the student will be able to:** CO1: Students are expected to understand highway planning &design. CO2: Students are expected to understand traffic Engineering. CO3: Students are expected to understand & evaluate highway construction material. CO4: Students are expected to develop exposure in pavement design. CO5: Students are expected to learn airport planning.

UNIT- I **CO-I**

Principal of Highway Planning- Road development and planning in India Highway alignment, requirements. Engineering Surveys for highway location Maps and Drawing. Elements of Transportation Engineering (Vehicle, Driver, Terminal and Control).Geometric Design:Cross Section elements of horizontal and vertical Alignment. Highway drainage, Surface and subsoil drainage. Geometry of Hill Roads, curve layout. **[7 Hours]**

UNIT-II **CO-II**

Traffic Engineering- Introduction to Traffic flow theory speed-density, speed-flow and flow-density relation, data collection techniques for traffic parameters and delay studies, parking facilities, etc. and their uses. Traffic control. Devices, Prevention of road accidents, rotary intersection, highway lighting,Highway materials: Behavior of highway materials, properties of Sub grade and pavement component materials. Tests on sub grade soil, Aggregate and bituminous materials. **[8 Hours]**

UNIT- III **CO-III**

Pavement Design - Study of flexible and rigid pavements, Basic concepts of pavement analysis and design. Stresses in rigid pavements. I.R.C. recommendations. **[7 Hours]**

UNIT-IV **CO-IV**

Pavement Construction Techniques and Quality Control -Types of Pavements water bound macadam, bituminous and cement concrete pavements. Joints in cement concrete pavements, pavement failures. Modern materials in pavements. **[7 Hours]**

UNIT-V **CO-V**

Airport Planning - Definition of terms related to airport engineering, factors affecting site, selection, obstructions, various surveys for site selection, zoning laws. Classification of Obstructions Runways Orientation, Basic runway length and its corrections. Geometric design, runway configuration taxiways layout geometric, Standards, exit taxiways fillets separation. **[7 Hours]**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Principle and Practices of Highway Engineering	Kadiyali	-	Khanna Publishers, Delhi
2	Highway Engineering	S. K. Khanna & C.E.G. Justo	-	Khanna Publishers, Delhi

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Air-port planning and Design	Khanna and Arora	-	Khanna Publishers, Delhi
2	Highway Engineering	Rangawala S.C.	-	Charotar Publishers
3	Manual for Survey , Investigation and Preparation of Road Projects	IRC Specifications	-	IRC Publication 2001

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SYLLABUS

B.Tech. (Civil Engineering) Fourth Semester

Subject Code: CE101491	Building drawing lab	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	25	

List of Experiments: (At least ten experiments are to be performed by each student)

1. Introduction to AutoCAD drafting package.
2. To draw the foundation details of internal and external walls.
3. To draw the single line plan of a residential building.
4. To draw the double line plan, elevation and section of single story residential building.
5. To draw the double line plan, elevation and section of double story residential building.
6. To draw the line plan of a primary school building.
7. To draw the line plan of a hostel building.
8. To draw the line plan of a hospital building.
9. To draw the plan and section of a fully furnished bathroom.
10. To draw the plan of dog-legged staircase.
11. To draw section and elevation of flush shutter, paneled shutter doors and windows.
12. To draw section and elevation of fully glazed, half glazed, half glazed and half paneled doors and windows.
13. To draw the perspective view of simple blocks and combination.

Equipment/Machines/Instruments/Tools/Software Required:

- PC system.
- AutoCAD Software.
- Drawing board.
- Drawing sheet.

Recommended Books:

S. No.	Title	Authors	Edition	Publisher
1	A course in Civil Engineering Drawing	V.B. Sikka	3rd Edition 2017	Katson Technical Publications)
2	Building Construction	B.C. Punmia	8th edition	(Laxmi Publication Pvt. Ltd.)

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SYLLABUS

B.Tech. (Civil Engineering) Fourth Semester

Subject Code: CE101492	SURVEYING & GEOMATICS LAB	L = 3	T = 1	P = 0	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	-

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To perform the experiment for reduction to centre from different positions of a satellite station when:
(i)Satellite station in north position, (ii) Satellite station in left position.
2. To perform the experiment for reduction to centre from different positions of a satellite station when:
(i)Satellite station in south position, (ii) Satellite station in right position.
3. To find the most probable value of angle for combined triangle by method of difference.
4. To find the most probable value of triangles of a quadrilateral shapes by method of correlates.
5. To find the most probable value of triangles by the method of Gauss rule.
6. Adjustment of two connected triangles.
7. Adjustment of quadrilateral by method of least square.
8. Adjustment of geodetic triangles with central station by method of least square.
9. Determination of Tacheometric constants.
10. Determination of elevation and distance when line of sight inclined upward.
11. Determination of elevation and distance when line of sight inclined downward.
12. Determination of elevation and height by tangential method when both angles are angles of elevation.
13. Study of Electronic Digital Theodolite.
14. Study of Total Station.
15. Study of Auto level.
16.Measurement of sides of a triangle using Laser Distance Meter.

Equipment/Machines/Instruments/Tools/Software Required:

Metric Chain(30 m)
Tape (15m, 30 m)
Ranging Rod (2m, 3m)
Plumb bob
Arrows
Theodolite
Electronic Digital Theodolite
Auto level
Total Station
Leveling Staff (Folding and Non-folding)
Wooden Pegs
Cross Staff
Laser Distance Meter.

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Surveying (Vol. I & II)	Punmia, B.C.	16TH Edition 1996	Laxmi Publications, New Delhi
2	Surveying (Vol. II & III)	Agor, R.	11TH Edition 2012	Khanna publications, Delhi
3	Surveying (Vol. I & II)	C. Venkataramaih	2ND Edition	Universities Press Hyderabad
4	Surveying (Vol. II)	S.K. Duggal	4TH Edition	McGraw Hill Publications

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Surveying (Vol. II & III)	Arora, K.R.	12TH Edition	Standard Book House, Delhi
2	Engineering Surveying Technology	Kennie, T.J.M. and Petrie G	1990	Blackie & Sons Pvt. Ltd., London
3	An Introduction to Remote Sensing and its Applications	Shivangi Somvanshi, Maya Kumari	1st Edition	S.K. Kataria and Sons, New Delhi
4	Surveying (Vol. I & II)	Kanetkar T.P.	15st Edition	Pune Vidyarthi Griha Prakashan, Pune

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SYLLABUS

B.Tech. (Civil Engineering) Fourth Semester

Subject Code: CE101493	Hydraulics Lab	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	

List of Experiments: (At least ten experiments are to be performed by each student)

1. To study the transition from laminar to turbulent flow and to determine the lower a critical Reynolds's number.
2. To study the velocity distribution in pipe and to compute the discharge by integrating Velocity profile
3. To study the variation of friction factor for pipe flow.
4. To determine the roughness coefficient of an open channel.
5. To determine the coefficient of discharge of a weir.
6. To determine the coefficient of discharge of a venturiflume.
7. Study of the hydraulic jump in an open channel.
8. To determine the coefficient of discharge of a spillway.
9. To study the performance characteristics of Pelton wheel turbine.
10. To study the performance characteristics of Francis turbine.
11. To study the performance characteristics of Kaplan turbine.
12. To study the performance characteristics of variable speed centrifugal pump.
13. To study the performance characteristics of rated speed centrifugal pump.
14. To study the performance characteristics of multistage pump.
15. To study the performance characteristics of reciprocating pump.

Equipment/Machines/Instruments/Tools/Software Required:

- Pipe Flow Apparatus Tilting Flume
- Pelton Wheel Turbine Francis Turbine
- Kaplan Turbine
- Variable Speed Centrifugal Pump Rated Speed Pump
- Multistage Pump
- Reciprocating Pump

Recommended Books:

S. No.	Title	Authors	Edition	Publisher
1	Hydraulics Laboratory Manual	S.K. Likhi	1st Edition	New Age International Ltd.
2	Fluid Mechanics	JagdishLal	2nd Edition	Metropolitan Educational, New Delh-2

Subject Code: CE101494	Engineering Geology Lab/ Mini Project-II	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	

List of Experiments: (At least ten experiments are to be performed by each student)

1. Identification of granite, pegmatite, syenite megascopic observations.
2. Identification of basalt, gabbro, charnokite, dolerite.
3. Identification of limestone, sand - stone, shale.
4. Identification of conglomerate, breccias, clay.
5. Identification of slate, phyllite, marble.
6. Identification of quartzite, schist, gneiss.
7. A study on simple geological maps.
8. To draw a cross section, filling of geological data there in.
9. To make a sketch of faults, with identification of folds, faults and unconformity.
10. A case Study of structural folds, faults and unconformity.
11. A study of Talc, gypsum, calcite, fluorite apatite.
12. A study of feldspar, quartz, topaz, corundum.
13. A study of hornblende, garnet, tourmaline asbestos, olivine.
14. A study of serpentine, barite, muscovite, biotite, orpiment, realgar, sulphur, amethyst & varieties of quartz, zeolite.
15. A study of hematite, magnetite, pyrite, chalespyrite, pyrolusite, psilomelane, beryl, magnesite, bauxite, zincite, galena etc.

Equipment/Machines/Instruments/Tools/Software Required:

- Crystallographic Model
- Wooden Cabinet
- Axis of symmetrical of 6 System
- Planes of symmetrical of 6 System
- Crystallographic Axis & Centre of System
- Mohr Scale of Hardness
- Streak Plates
- Hardness Testing Knife
- Model Showing Strike, Dip, Pitch
- Symmetrical Anticline Showing Axis-Axial Plane
- Asymmetrical Anticline Showing Axis-Axial Plane
- Isoclinals Anticline & Syncline
- Recumbent Fold
- Fan Fold
- Step Fault
- Rock Specimen
- Wooden Specimen Tray
- Polarizing Petrological Microscope
- Mineral Specimens

Books:

S. No.	Title	Authors	Edition	Publisher
1	Geology and Engineering	Leggot, R.F.		Mc-Graw Hill, New York
2	. Engineering and General Geology	– Prabin Singh		Katson Publication House

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SYLLABUS

B.Tech. (Civil Engineering) Fourth Semester

Subject Code: (AC100495)	BIOLOGY FOR ENGINEERS	L = 0	T = 0	P = 0	Credits = 0
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	-	-	25	25	-

Course Objectives	Course Outcomes
The objective of this course is to impart an understanding of fundamentals of biological systems and its applications towards industries to solve the problems in the real life.	**On successful completion of the course, the student will be able to:** **CO1:** Describe how biological observations of 18th Century that lead to major discoveries.. **CO2:** Convey that classification *per se* is not what biology is all about highlight the underlying criteria, such as morphological, biochemical ecological. Highlight the the concepts of genetic material and its segregat and independent assortment. **CO3:** Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. Classify enzymes and distinguish between different mechanisms of enzyme action. Concept of genetic code. Universality and degeneracy of genetic code **CO4:** Identify DNA as a genetic material in the molecular basis of information transfer. The fundamental principles of energy transactions in physical and biological world. Thermodynamics properties of different biological systems. **CO5:** Apply thermodynamic principles to biological systems. Identify and classify microorganisms. A Brief Account of Evolution

Unit 1. INTRODUCTION **CO1**

Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics, Chemistry, and Engineering and technology.

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

[2 hours]

Unit 2. CLASSIFICATION & GENETICS **CO2**

Purpose: To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Discuss the concept human genetics.

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy.Classification. Discuss based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) Energy and Carbon utilization -Autotrophs,Heterotrophs, Lithotropes (d) Ammonia excretion – Aminotelic, Uricotelic, Ureotelic (e) Habitataacquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M.musculus.

Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics. **[3 hours]**

Unit 3. BIOMOLECULES & INFORMATION TRANSFER CO3

Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine. The molecular basis of coding and decoding genetic information is universal

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination. [**4 hours**]

Unit 4. MACROMOLECULAR ANALYSIS & ITS METABOLISM CO4

Purpose: How to analyses biological processes at the reductionist level. Concept of Energy change.

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and Energy consuming reactions. Concept of Energy change. **[3 hours]**

Unit 5. MICROBIOLOGY EVOLUTION CO5

Purpose: The fundamental concept and principles of Microbiology.

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Origin of Universe, Origin of Life, Evolution of Life Forms, Evidences of Evolution, Adaptive Radiation, Theories of Evolution Biological Evolution, Hardy–Weinberg Principle, **[3 hours]**

Text Books:

S. No.	Title	Author(s)
1.	Bology: A global approach	Campbell, N. A, Reece, J. B., Urry, Lisa, Cain, M, L., Wasserman, S. A., Miniorsky, P. V., Jackson, R. B.
2.	Outlines of Biochemistry	Conn, E.E, Stumpf, P.K., Bruening G., Doi R.H.
3.	Principles of Biochemistry	Nelson D. L. and Cox M.M.W.H.
4.	Molecular Genetics	Stent, G. S.; and Calender, R.W.H.
5.	Microbiology	Prescott, L.M J.P. Harley and C.A. Klein

Reference Books:

S. No.	Title	Author(s)
1.	Biology For Engineers	Dr Tanu Allen, Dr Sohini Singh
2.	Biology For Engineers	Arthur T.Johnsion
3.	Molecular. Cellular and tissue Engineering	Joseph D .Bronzino,Donal R .Peterson
4.	Biology For Engineers	Rajiv Singal,Gaurav Agrawal,Ritu Bir
5.	Biology For Engineers	G,K,Suraish Kumar