Shivaji University, Kolhapur

Department of Technology

SECOND YEAR B.TECH

Civil Engineering

Scheme of Teaching and Examination

Semester – III

Subject Code	Subject	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credits	Scheme	Max. marks	Min. Passing $	Scheme	Max. marks	Min. Passing
MA211	Engineering Mathematics-III	03	01	-	04	CIE	50	20	IOE	50	20
						SEE	50	20	--------	-------	--------
CE211	Surveying	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CE212	Strength of Materials	03	01	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CE213 *	Construction Technology	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CE214	Fluid Mechanics-I	03	01	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	---------
CEL211	Lab-I Surveying	-	-	04	02	--------	-------	--------	IPE	50	20
						--------	-------	--------	EPE	50	20
CEL212	Lab-II Strength of Materials	-	-	02	01	--------	-------	--------	EPE	50	20
						--------	-------	--------			
CEL213	Lab-III Construction Technology	-	-	02	01	--------	-------	--------	EOE	50	20
CEL214	Lab-IV Fluid Mechanics-I	-	-	02	01	--------	-------	--------	IPE	50	20
	Total	**17**	**03**	**10**	**25**	--------	**500**	--------	--------	**300**	--------

HS222	Environmental Studies	2	-	-	-	Project	30	40	--------	-------	--------
						Theory	70				
Audit Course I											
HS211	Introduction to Foreign Language	-	-	02	-----	Institute Level	-----	-------	-------	------	-------

Total Credits: 25
Total Contact Hours/Week: 30 hrs

Note:
$: Minimum 40% marks required in CIE to become eligible for SEE.

• Tutorials and practical shall be conducted in batches with batch strength not exceeding 18 students.
CIE – Continuous Internal Evaluation, SEE – Semester End Examination,
IPE – Internal Practical Evaluation, EPE–External Practical Examination,
IOE– Internal Oral Evaluation, EOE–External Oral Examination

Shivaji University, Kolhapur

Department of Technology

SECOND YEAR B.TECH

Civil Engineering

Scheme of Teaching and Examination

Semester – IV

Subject Code	Subject	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credits	Scheme	Max. marks	Min. Passing $	Scheme	Max. marks	Min. Passing
CE221	Theory of Structures -I	04	01	-	05	CIE	50	20	--------	-------	------
						SEE	50	20	--------	-------	------
CE222	Engineering Geology	03	-	-	03	CIE	50	20	--------	-------	-----
						SEE	50	20	--------	-------	------
CE223	Fluid Mechanics-II	03	01	-	04	CIE	50	20	--------	-------	------
						SEE	50	20	--------	-------	------
CE224	Concrete Technology	04	-	-	04	CIE	50	20	--------	-------	------
						SEE	50	20	--------	-------	------
CE225	Building Planning and Design	04	-	-	04	CIE	50	20	--------	-------	------
						SEE	50	20	--------	-------	------
CE222	Lab-I Engineering Geology	-	-	02	01	--------	-------	--------	IPE	50	20
CE223	Lab-II Fluid Mechanics	-	-	02	01	--------	-------	--------	EPE	50	20
CE224	Lab-III Concrete Technology	-	-	02	01	--------	-------	--------	EPE	50	20
CE225	Lab-IV Building Planning & Design	-	-	04	02	--------	-------	--------	IPE	50	20
						--------	-------	--------	EPE	50	20
	Total	**18**	**02**	**10**	**25**	--------	**500**	--------	--------	**300**	--------

HS222	Environmental Studies	2	-	-	-----	Project	30	40	-------	------	-------
						Theory	70				
Audit Course II											
HS221	Introduction to Performing Arts	01	-	02	-----	Institute Level	-----	-------	-------	------	-------

Total Credits: 25

Total Contact Hours/Week: 29 hrs

Note: $: Minimum 40% marks required in CIE to become eligible for SEE.

• Tutorials and practical shall be conducted in batches with batch strength not exceeding 18 students.

CIE – Continuous Internal Evaluation, SEE – Semester End Examination,
IPE – Internal Practical Evaluation, EPE–External Practical Examination,
IOE– Internal Oral Evaluation, EOE–External Oral Examination

Detailed Examination Scheme

1. Out of total 100 theory marks, 50 marks are allotted for Continuous Internal Evaluation (CIE). In CIE minimum 20 marks are required to become eligible for Semester End Examination. (SEE).

2. CIE (50 marks) includes :

    - Internal Test – 1, of 25 marks in 5^{th} week on 1^{st} and 2^{nd} unit
    - Internal Test - 2, of 25 marks in 10^{th} week on 3^{rd} and 4^{th} unit

3. For the Semester End Examination (SEE), 100 marks (3 hrs.) paper will be set and finally it will be converted to 50 marks, in which student must secure minimum 40 % i.e. 20 marks as an university examination passing head.
4. Final theory marks (out of 100) will be the addition of CIE (out of 50 marks) and SEE (out of 50 marks).
5. Internal Practical Evaluation (IPE) will be assessed on the basis of Internal Oral/ Practical/Tutorials/seminar in which student must secure minimum 40% i.e. 20 marks.
6. *Semester End Examination duration will be 4 hrs.

Academic Autonomy:

1. Flexibility in deciding Structure and Contents of Curriculum with reasonable frequency for changes in the same.
2. Continuous Assessment of Students performance with newly adopted - Credit System based on Award of Grade.
3. Credits are quite simply a means of attaching relative values to courses different components. They are a currency of learning, and in general regarded as a measure of the time typically required to achieve a given curricular outcome.
4. All subjects (year-wise) under each course/discipline are unitized.

Credit system:

Education at the Institute is organized around the semester-based credit system of study. The prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow a student to progress at an optimum pace suited to his/her ability or convenience, subject to fulfilling minimum requirements for continuation.

A student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point average is calculated. A minimum grade point average is required to be maintained for satisfactory progress and continuation in the program. Also a minimum number of earned credits and a minimum grade point average should be acquired in order to qualify for the degree. All programs are defined by the total credit requirement and a pattern of credit distribution over courses of different categories.

Course credits assignment:

Each course, except a few special courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and laboratory contact hours in a week. This weight-age is also indicative of the academic expectation that includes in-class contact and self-study outside of class hours.

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

Practical/Laboratory: One laboratory hour per week per semester is assigned half credit.

Example: Course : Concrete Technology: 4 credits (3-0-2)

The credits indicated for this course are computed as follows:

3 hours/week lectures = 3 credits

0 hours/week tutorial = 0 credit

2 hours/week practical = 2 × 0.5 = 1 credit

Also, (3-0-2) **4** credit course = (**3** h Lectures + **0** h Tutorial + **2** h Practical) per week

= **5** contact hours per week

For each lecture or tutorial credit, the self study component is 1 hour/week and 2 hours/week. In the above example, the student is expected to devote 3 + 1 = 4 hours per week on self study for this course, in addition to class contact of 5 hours per week.

Earning credits:

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average.

The credit system enables continuous evaluation of a student's performance, and allows the students to progress at an optimum pace suited to individual ability and convenience, subject to fulfilling minimum requirement for continuation.

Features of Credit System at Department of Technology, Shivaji University, Kolhapur:

Every subject is allotted credits based on its academic importance/weight age.

1. All subjects may not have same credits.
2. 25 Credits / Semester.
3. Absolute Grading System with 6 Passing Grades viz. AA, AB, BB, BC, CC, CD, DD and FF for failure.
4. Getting FF grades in 4 heads in the one academic year he/she considered as failed.
5. Continuous Evaluation: Internal Test 1 [25 marks], and Internal Test 2 [25 marks].
6. Standardization of courses; each course is of 6 units. T1 for UNIT 1 and 2, T2 for UNIT 3 and 4, SEE for all units.
7. Internal Test 1 & Internal Test 2 handled by internal; SEE mostly by external.
8. Under no circumstances will a request for re-test be entertained after internal test.
9. Re-examination after SEE; No examination for odd sem. courses in even sem. or vice-versa.

Attendance rule:

All students must attend every lecture, tutorial and practical class. However, to account for late registration, sickness or other such contingencies, the attendance requirement will be a minimum of 75 % of the classes actually held. A student with less than 75 % attendance in a course during the semester, in lectures, tutorials and practicals taken together (as applicable), will be awarded an 'XX' grade in that course irrespective of his/her performance in the tests.

The course coordinator will award 'XX' grade to the student who is deficient in attendance taking into account the consolidated attendance record for the whole semester. For the purpose of attendance calculation, every scheduled practical class will count as one UNIT irrespective of the number of contact hours.

Attendance record will be maintained based upon roll calls (or any equivalent operation) inevery scheduled lecture, tutorial and practical class. The course coordinator will maintain and consolidate attendance record for the course (lectures, tutorials and practicals together, as applicable).

Evaluation system:

1. Semester Grade Point Average (SGPA) =

$$\frac{\sum (\text{course credits in passed courses X earned grade points})}{\sum (\text{Course credits in registered courses})}$$

2. Cumulative Grade Point Average (CGPA) =

$$\frac{\sum (\text{course credits in passed courses X earned grade points) of all Semesters}}{\sum (\text{Course credits in registered courses) of all Semesters}}$$

3. At the end of B. Tech Program, student will be placed in any one of the divisions as detailed below (According to AICTE Handbook):

   Ist Division with distinction: CGPA $\geq$ 8.25 and above

   Ist Division : CGPA $\geq$ 6.75 and < 8.25

   IInd Division : CGPA $\geq$ 6.75 and < 6.25

An example of these calculations is given below:

Typical academic performance calculations - I semester

Course no.	Course credits	Grade awarded	Earned credits	Grade points	Points secured
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6 (col4 *col5)
MALXXX	5	CC	5	6	30
CSLXXX	4	CD	4	5	20
PHLXXX	4	AA	4	10	40
PHPXXX	2	BB	2	8	16
MELXXX	4	FF	0	0	00
TTNXXX	2	AB	2	9	18
Total	21		17	38	124

1. Semester Grade Point Average (SGPA) =

$$\frac{(124)}{(21)} = 5.90$$

2. Cumulative Grade Point Average (CGPA) =

   Cumulative points earned in all passed courses = 124 (past semesters) + 124 (this sem.) = 248

   Cumulative earned credits = 23 (past semesters) + 21 (this sem.) = 44

$$\frac{\sum (124 + 124)}{\sum (23 + 21)} = 5.63$$

System of Evaluation

Grade	Grade Points	Range	Description of Performance
AA	10	91-100	Outstanding
AB	09	86-90	Excellent
BB	08	76-85	Very Good
BC	07	66-75	Good
CC	06	56-65	Fair
CD	05	46-55	Average
DD	04	40-45	Poor
FF	00	Below 40	Fail (Eligible for Re-exam)
XX	--	--	Insufficient attendance
AB	--	--	Absent
$	--	--	Passed in Ist attempt

Audit Courses:

Additional courses shall be included as audit courses from the third semester onwards. While the performance of the student in audited courses shall be included in the Grade Card. These grades are not contributed to SGPA or CGPA of the concerned student.

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester III)

MA211 ENGINEERING MATHEMATICS – III

Teaching Scheme: L: 3 hrs/week **Credits: 4**

: T: 1 hrs/week

Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**
	IOE		
	50		

UNIT 1 **7 hrs**

Linear Differential Equations: Linear Differential Equations with constant coefficients, Homogenous Linear differential equations

UNIT 2 **6hrs**

Applications of Linear Differential Equations: Applications of Linear Differential Equations with constant coefficients to civil engineering problems (Cantilever,
Strut and beam).

UNIT 3 **6 hrs**

Partial differential equations: Four standard forms of partial differential equations of first order.

UNIT 4 **7 hrs**

Curve Fitting: Fitting of Curves by method of Least-squares, Coefficient of correlation, Spearman's rank correlation coefficient and lines of regression of bivariate data.

UNIT 5 **6 hrs**

Probability: Random variable, Probability mass function and probability density function, Binomial, Poisson and Normal distributions.

UNIT 6 **7 hrs**

Vector Calculus:

Vector Differentiation: Differentiation of vectors, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function. Irrotational and solenoidal vector field.

Vector Integration: The line integral, Surface integral, volume integral, Gauss's Divergence theorem, Stoke's theorem, Green's theorem (Without proof).

Refeerence Books::

1. Ashok Saxena and N. Ch. S. N. Iyengar , N. P. Bali, "A textbook of Engineering
2. Dr. B. S. Grewal, "Higher Engineering Mathematics".
3. Erwin Kreyszig, "Advanced Engineering Mathematics".
4. J. N. Wartikar & P. N. Wartikar , "A text book of Applied Mathematics" Vol. I, II and III, Vidyarthi Griha Prakashan, Pune.
5. Mathematics", Laxmi Publication, Delhi.
6. S. C. Gupta, "Fundamental of Statistics".

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester III)

CE211 SURVEYING

Teaching Scheme: L: 4 hrs/week **Credits: 4**

Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1 **9 hrs**

a) **Introduction:** Construction and Permanent adjustments of Dumpy Level, Tilting & Auto Level.

b) Sensitivity of Bubble Tube; Correction for curvature and refraction.

c) Reciprocal levelling

d) **Precise Levelling**: Study of Precise level, classification based on precision limits, Field Procedure.

UNIT 2 **8 hrs**

a) Contouring Methods and application of contour maps for alignments and capacity of reservoir.

b) **Planimeter:** Types, Theory, concept of zero circle, Study of Digital Planimeter.

c) Computation of Areas and Volumes.

UNIT 3 **9 hrs**

Plane Table Survey: Equipment and Accessories, methods, Two point and Three point problems, and contouring with plane table. Use of Tangent Clinometer and Telescopic Alidade.

UNIT 4 **10 hrs**

a) **Theodolite:** Vernier, Micro optic and electronic. Vernier Theodolite- Construction, Adjustments and uses. Methods of horizontal and vertical angle measurement. Use of Electronic Theodolite.

b) **Trigonometric Levelling**: Single and Double Plane Method.

c) **Theodolite Traversing:** Objectives and types. Closed traverse- balancing, correction, Gale's Traverse table. Omitted Measurements.

d) **Tacheometric Surveying**

UNIT 5 **8 hrs**

Curves

a) Horizontal curves: Elements, Setting out of simple curves by linear and angular methods. Simple, compound, reverse and transition curves.

Transition Curves- Types, Elements, Length, and concept of ideal transition curve.

b) Vertical curves: Types, Introduction to compound reverse and combined curves.

Methods of setting out.

UNIT 6 **8 hrs**

Modern Surveying Instruments

Electromagnetic waves and their properties, phase, phase comparison, Modulation, Types of Electromagnetic Distance Meters [E.D.M.] – Geodimeter, Tellurometer, Distomat. Total Station and its uses and all other minor instruments.

Note - Due emphasis should be given to numerical problems during the course work and examinations.

Refeerence Books:

1. Agor, "Surveying", Khanna Publications, Delhi.
2. Alak De, S.Chand and Company "Plane Surveying".
3. Basak, Tata Mcgraw Hill, "Surveying and Levelling".
4. B.C.Punmia, "Surveying", Laxmi Publications New Delhi. Vol.1 & 2
5. Jawaharlal Sharma, "Surveying", Publishers,Delhi.
6. K.R. Arora, "Surveying", Vol.1 &2.
7. Plane and Geodetic, David Clark, Surveying.
8. Raymond and Baker, "Surveying", Pearson Education.
9. S.K.Duggal, Tata Mcgraw Hill Publications, New Delhi, Vol.1&2. "Surveying".
10. T.P.Kanetkar and S.V.Kulkarni, "Surveying and Levelling", Vidhyarthi Griha Prakashan, Pune, Vol.1 & 2.

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester III)

CE 212 STRENGTH OF MATERIALS

Teaching Scheme: L: 3 hrs/week **Credits: 4**

T: 1 hr/week

Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1 **6 hrs**

a) Concept of stress and strain:

Mechanical properties of Materials (Elasticity, Plasticity and Creep) ; Linear, lateral, shear and volumetric stresses, bearing stress; Elastic constants (E, G, K and J) and their relationship ; Stress-strain curves for Brittle and Ductile materials ; Allowable Stresses and factor of safety ; Uniaxial and multiaxial loading ; Generalized Hooke's law

b) Determinate and Indeterminate Bars:

Axial force diagram ; Equilibrium and Compatibility Equations ; Stresses, strains and deformations in determinate and indeterminate, homogenous and composite bars, under concentrated loads and thermal effects.

UNIT 2 **7 hrs**

a) Shear and bending moment in beams:

Concept and definition of Shear Force and Bending Moment ; Plotting S.F. and B.M. diagrams due to point load, uniformly distributed load, linearly varying loads and moments in determinate simple and compound beams, bents and plane frames ; Relation between SF, BM and intensity of loading .

b) Flexure Stresses:

Theory of pure bending, Curvature of a beam ; Assumptions, Derivation of flexure formula ; Moment of resistance of cross section ; Bending stress distribution diagrams for symmetrical and unsymmetrical sections ; Flitched beams.

UNIT 3 **6 hrs**

a) Shear stresses:

Concept, Analysis of Flexure action ; Derivation of shear stress formula and its limitations Horizontal and vertical shear stress ; Shear stress distribution diagrams for standard sections ; Built up sections ; Maximum and average shear stress.

b) Torsion of Circular Shaft:

Torsional deformations of a Circular Bar ; Theory of torsion of shafts of circular cross section ; Assumptions, Derivation of torsion formula ; Stress concentrations in torsion ; Stresses, Strains and Deformations in determinate and indeterminate shafts of hollow, solid, homogenous and composite cross section subjected to twisting moments ; Twisting moment diagrams; Transmission of power , circular shafts.

UNIT 4 **7 hrs**

a) Principal stresses and Principal strains :

Normal and Shear stresses on any oblique plane ; Concept of principal planes and principal stresses ;Derivation of principal stresses, maximum shear stresses ; Orientation of principal planes , analytical and graphical methods (Mohr's circle of stress 2-D).

b) Combined effects:

Combined Effects of axial stress, Bending moment, shear force and Torsional moment . Theories of failure: Maximum normal stress, Maximum shear stress and Maximum strain Theory.

c) Thin Cylindrical and spherical shells under internal fluid pressure

UNIT 5 **6 hrs**

a) Axially loaded Columns:

Concept of stability, critical load and buckling ; Derivation of Euler's formula for buckling load with hinged ends ; Concept of equivalent length for various end conditions Rankine's formula, Secant formula ; Safe load on column ; Limitations of Euler's formula.

b) Direct and Bending Stresses:

Concept of direct and bending stresses ; Applications to eccentrically loaded short columns, retaining walls, dams, chimneys etc. ; Effect of lateral force and self-weight ; Resultant Stress diagrams due to axial loads, uniaxial, and biaxial bending ; Concept of core of section for standard symmetrical sections. No tension condition

UNIT 6 **7 hrs**

a) Slope and Deflection of Determinate Beams:

Differential Equation of the elastic curve ; Concept and definition ; Relation between bending moment, slope and deflection ; Slope and deflection , double integration method (using bracket functions) under point load, uniformly distributed loads and concentrated moments.

b) Slope and Deflection in determinate Beams:

Moment Area Method, Moment area theorems ; Conjugate beam method.

Refeerence Books:

1. Beer and Johnston, "Mechanics of Material", Mc Graw Hill publication.
2. Bhavikatti S.S., " Strength of Materials" , New Age Publications.
3. F. L. Singer and Pytel, "Strength of Material", Harper and Row publication.
4. Gere and Timoshenko, "Mechanics of Materials" , CBS publishers.
5. J.B. Popov, "Introduction to Mechanics of Solids" , Prentice – Hall publication.
6. Junnarkar S.B. and Advi, "Mechanics of Structure" (Vol. I & II), Charotar publication.
7. Punmia, Jain, "Mechanics of Materials" (Vol. I & II) , Laxmi Publications.
8. R.C. Hibbler, "Mechanics of Materials", Pearson Education.
9. S Ramamrutham, " Strength of Materials", Dhanapat Rai Publications.

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Second Year B. Tech (CIVIL ENGINEERING) (Semester III)

CE 213 CONSTRUCTION TECHNOLOGY

Teaching Scheme: L: 4 hrs/week **Credits: 4**

Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1 **10 hrs**

Engineering properties of following materials:

Stones – Requirements of good building stone, uses of building stones.

Bricks – Manufacturing, Types and Engineering Properties.

Aggregates - Fine Aggregates and coarse aggregates - Origin, types, particle size and shape, mechanical and physical properties, grading, sieve analysis.

Timber – Natural & Artificial wood and their application in Civil Engineering.

Steel – Standard sections, steel as reinforcement. High Yield Strength Steel and high tensile steel, uses of steel in Building Construction. Anti-corrosive treatments.

Cement- Ordinary Portland, rapid hardening and low heat cements, main properties.

Tiles - Ceramic, Vitrified, Natural Stone/Mosaic, Paving Blocks etc.

Miscellaneous – Aluminum, Glass, Plastic etc.

UNIT 2 **7 hrs**

Basic requirements of a building as a whole: strength and stability, Dimensional stability, comfort and convenience, damp prevention, water-proofing techniques, heat insulation, day lighting & ventilation. Sound insulation and anti termite treatment.

Building components and their basic requirements : Foundations, plinth, walls and columns in superstructure, floors, doors & windows, sills, lintels and weather sheds, roofs, steps and stairs, utility fixtures.

Formwork for basic RCC elements: Ideal Requirements & types.

Foundations: Stepped, isolated, combined, strip, raft, strap or cantilever, pile.

UNIT 3 **9 hrs**

Plain cement concrete : Properties, Grades and their uses.

Stone masonry : Random Rubble, Uncoursed Rubble, Coursed Rubble & Ashlar Masonry.

Brickwork & Brick Bonds : English, Flemish, Principles Observed During Construction

UNIT 4 **7 hrs**

Composite masonry, various partition walls, brick, aluminium & timber.

Solid concrete blocks, hollow concrete blocks and light weight blocks (Siporex), soil stabilized blocks, Fly Ash Blocks.

UNIT 5 **9 hrs**

Arches: Arches and their stability consideration, technical terms in arches, types of arches, methods of construction.

Lintel: Necessity, Materials: wood, stone, brick, steel, R.C.C. and reinforcedbrick lintels.

Doors : Classification, T.W. Paneled Door, Flush Door, Aluminum Glazed Doors, Steel Doors, fixtures and fastening.

Windows : Classification, T.W. Glazed Windows, Aluminum Glazed Windows, Steel Windows, fixtures and fastening.

Stairs: Technical terms, requirements of a good stair, uses, types, materials for construction. Design of stairs (Dog Legged and Open Well)

UNIT 6 **10 hrs**

Roofs and Roof coverings: Terms used. Roof and their selection, pitched roofs and their types, Timber Trusses (King Post and Queen Post), Steel Trusses types and their suitability, roof coverings and their selection.

G**round and Upper floors and factors for selections of floorings:** Various types of Tile flooring (Natural and Artificial Material), Concrete Flooring (Tremix Flooring)

Construction of upper floors: R.C.C. slabs, R.C.C. beams and slab. Flat slab floor.

Refeerence Books:

1. B.C.Punmia, “Building Construction”, Laxmi Publications.
2. G. K. Hiraskar , “Basic Civil Engineering”, Dhanpat Rai Publications.
3. S.P. Arora, S.P. Bindra, “A Text Book of Building Construction”, Dhanpat Rai Publications.
4. “I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings”.
5. M. Chakraborty, “Civil Engineering Drawing”.
6. M. M. Goyal (Amrindra Consultancy (P) Ltd.), “Handbook of Building Construction”.
7. R. Chudley (ELBS), “Construction Technology”, (Volume 1 to 4).
8. R.K.Rajput, “Engineering Materials”, S. Chand
9. Sandeep Mantri “A to Z of Practical Building Construction and Its Management”, Satya Prakashan, New Delhi.
10. SP 7, “National Building Code Group 1 to 5”, B.I.S. New Delhi
11. V.B.Sikka, “A Course in Civil Engineering Drawing” , S.K.Kataria and Sons.

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Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester III)

CE 214 FLUID MECHANICS - I

Teaching Scheme: L: 3 hrs/week **Credits: 4**

T: 1 hr/week

Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1 **7 hrs**

a) Properties of Fluids

Physical properties of fluids: density, specific weight, specific volume, relative density, Newton's Law of Viscosity, dynamic and kinematic viscosity, Classification of fluids, Reheological diagram, Newtonian and Non-Newtonian fluids, ideal and real fluids, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure, manometer.

b) Dimensional Analysis and Model studies

Dimensions of physical quantities, Dimensional homogeneity, Dimensional analysis using Buckingham's II theorem, important dimensionless parameters and their significance. Geometric; Kinematic and Dynamic similitude; Model laws, Types of models. Applications of dimensional analysis and model studies to fluid flow problems.

UNIT 2 **6 hrs**

a) Fluid Statics:

The basic equation of hydrostatics, Concept of pressure head, Measurement of pressure datum (absolute gauge), Application of the basic equation of hydrostatics.

Piezometers, Simple and differential manometers, inclined manometers, Introduction to pressure transducers. Total pressure, Centre of pressure, Total pressure and Centre of pressure for plane and curved surfaces, Pressure diagrams, Practical applications (gates, dams, lock gates)

b) Buoyancy and floatation:

Principle of floatation and Buoyancy, Equilibrium of floating bodies, Stability of floating bodies, metacentre, metacentric height and its determination (experimental and analytical), Stability of submerged bodies. Relative Equilibrium of liquids: Fluid masses subjected to uniform linear acceleration and rotation

UNIT 3 **7 hrs**

a) Fluid Kinematics:

Methods for describing the motion of fluid; Velocity and acceleration of fluids, Types of flow: steady and unsteady, uniform and non-uniform, Laminar and Turbulent, one, two, three-dimensional flows in Cartesian co ordinates, control volume, Stream lines, stream tube, path lines, Streak lines, Equation of continuity for three dimensional flow in Cartesian co ordinates, Equation of continuity for one-dimensional flow along a streamline, Rotational and irrotational motions, Circulation and vorticity, Velocity potential, stream function and flow net, Methods of drawing flow net, uses and limitations of flow net

b) Fluid Dynamics:

Forces acting on fluid mass in motion, Eulers equation of motion along a streamline and its integration,

Assumptions of Bernoulli's equation, Kinetic energy correction factor, Hydraulic Grade line and total energy line, Linear momentum equation and momentum correction factor, angular momentum, Applications of continuity, Bernoulli and momentum equations.

UNIT 4 **6 hrs**

a) Applications of Bernoulli's Equation

Flow through orifices and mouthpieces under free and submerged condition, venturimeter, orifice meter, Nozzle meter, rotameter and pitot tube

b) Flow over Notches and weirs

Classification of notches and weirs, Discharge over a sharp crested rectangular notch, velocity of approach, end contractions, discharge over a triangular notch, trapezoidal notch, Cippoleti notch, Ventilation of weir, time required to empty a tank.

UNIT 5 **7 hrs**

a) **Laminar flow:**

Reynolds Experiment, Laminar flow through a circular pipe, Flow between two fixed parallel plates, Stokes' law, Methods of measurement of viscosity, Flow through porous media, Darcy's law, Transition from laminar to turbulent flow

b) **Boundary layer Theory:**

Development of boundary layer on a flat plate, Nominal, displacement and momentum thickness, Laminar, turbulent and transitional boundary layer, Application of momentum equation for boundary layer development, Local and mean drag coefficients, Hydro dynamically smooth and rough boundaries, Boundary layer separation and its control.

UNIT 6 **6 hrs**

Turbulent Flow:

Characteristics of turbulent flow, Instantaneous velocity, temporal mean velocity, Scale of turbulence and intensity of turbulence, Semi-empirical theories to estimate shear stresses in turbulent flow- Boussinesq's theory, Prandtl's mixing length theory, Velocity distribution in turbulent flow- Prandtl's velocity distribution equation, Karman Prandtl velocity distribution equations for smooth and rough boundaries, Equation for mean velocity for pipes, Darcy Weisbach Equation, Variation of friction factor for laminar flow and for smooth rough turbulent flow; Nikuradse's experiments on artificially roughened pipes, Friction factor for commercial pipes. Moody's diagram, explicit equation for friction factor.

a) **Flow through pipes:**

Energy losses in pipe flow (major losses and minor losses),Flow through pipes such as simple, compound, parallel, branched pipes and siphons, Dupits equations, Hydraulic transmission of power through pipes,

Introduction to three-reservoir problem and pipe network.

Note- More emphasis would be given on Numericals in the course work.

Recommended Books:

1. A.K. Jain, "Fluid Mechanics", Khanna Pub., Delhi.
2. Arora, "Fluid Mechanics"
3. Franzini and and Fennimore, " Fluid Mechanics", Engineering applications Daugherty,
4. Garde-Mirajgaonkar, " Fluid Mechanics", Nemchand & Bros., Roorkee
5. H. Rouse , "Elementary Fluid Mechanics", Toppan C. Ltd. Tokyo
6. Modi / seth, "Fluid Mechanics – Hydraulic & Hydraulic Mechanics", Standard Book House, Delhi
7. Shames, " Fluid Mechanics", McGraw-Hill International Book Co., Auckland
8. S. Nagrathanam, " Fluid Mechanics", Khanna Pub., Delhi
9. Streeter, " Fluid Mechanics", Tata McGraw-Hill International Book Co., Auckland

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester III)

Laboratory-I

CEL 211 SURVEYING

Teaching Scheme: P: 4 hrs/week **Credits: 2**

Evaluation Scheme: IPE: 50 **Minimum Passing Marks: 20**

EPE: 50

Experiments:

1. Use of Dumpy Level, Auto Level and Tilting Level.
2. Reciprocal Levelling
3. Sensitivity of Bubble Tube using Dumpy Level
4. Illustration of Permanent adjustment of Dumpy Level.
5. Evaluation of constant of Planimeter.
6. Use of Digital Planimeter for measurement of areas.
7. Study of Theodolite
8. Measurement of horizontal angle , various methods
9. Measurement of Magnetic bearing and vertical angle , theodolite
10. Study and use of Minor Instruments
11. Methods of Plane Table Survey
12. Two Point and Three Point Problems
13. Study and use total station
14. Tachometric Survey.

Projects

1. Block contouring project
2. Theodolite Traversing Project

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester III)

Laboratory-II

CEL 222 STRENGTH OF MATERIALS

Teaching Scheme: P: 2hrs/week **Credit: 1**

Evaluation Scheme: EPE: 50 **Minimum Passing Marks : 20**

A. Experiments (any five):

1. Tension test on Mild and TOR steel.
2. Compression test on different metals.
3. Compression test on Timber (parallel & across the grains).
4. Shear test on Mild steel.
5. Brinell and Rockwell Hardness test on different metals.
6. Impact test on different metals.

B. Experiments (any Two):

1. Bending test on Mild steel.
2. Flexure test on flooring tiles.
3. Water absorption & compression test on Burnt brick.

C. At least one numerical assignment on each unit.

Shivaji University, Kolhapur

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Second Year B. Tech (CIVIL ENGINEERING) (Semester III)

Laboratory-III

CEL 213 CONSTRUCTION TECHNOLOGY

Teaching Scheme: P: 2hrs/week **Credit: 1**

Evaluation Scheme: EOE: 50 **Minimum Passing Marks: 20**

1.Drawing to a scale, draw on half imperial drawing sheet.

- **a)** Foundations: - Isolated, Combined Footing, Under Reamed Piles.(With reinforcement details)
- **b)** Stone Masonry: UCR, Course Rubble
- **c)** Brick masonry: English bond, Flemish bond
- **d)** Doors: T.W. Panelled Door.
- **e)** Windows: T.W. Glazed Window.
- **f)** Stairs: Dog legged and Open well.
- **g)** Timber Trusses: King Post and Queen Post.

2.Sketch Book :

- **a)** Lettering, Symbols, Types of lines and dimensioning as per IS 962.
- **b)** Stone masonry: Ashlar, Ashlar chamfered Polygonal and Dry masonry.
- **c)** Doors: Flush doors, Revolving door, Collapsible door and rolling shutter.
- **d)** Windows: Louvered window, Sliding Window, Bay window, Casement window, Dormer Window, Corner Window.
- **e)** Roofs: Line Sketches of steel trusses for different spans.
- **f)** Stairs: Quarter turn, bifurcated, Spiral, Geometrical.
- **g)** R.C.C. Literals & Chajja

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester III)

Laboratory-IV

CEL 213 FLUID MECHANICS

Teaching Scheme: P: 2hrs/week **Credit: 1**

Evaluation Scheme: IPE: 50 **Minimum Passing Marks: 20**

Experiments

a) Measurement of discharge - Calibration of measuring tank, measurement of pressure (Piezometer, manometers, Pressure gauges) Use of hook or point gauge.

b) At least **EIGHT** experiments from the following.

1. Verification of Bernoulli's Theorem
2. Determination of metacentric heights
3. Plotting of streamlines, flownets
4. Calibration of an orifice / mouthpiece
5. Calibration of venturimeter / orificemeter
6. Study of factors affecting coefficient of friction for pipe flow (at least for two different materials and two different diameters)
7. Determination of loss of head due to i) Sudden expansion, ii) contraction iii) elbow iv) bend v) globe valve etc.
8. Study of Laminar flow
9. Study of Moody's charts, nomograms for pipe design.
10. Flow net by electrical analogy for flow below weir (with and without sheet pile)
11. Calibration of 'V' notch / Rectangular notch.
12. Calibration of sharp crested suppressed weir and plotting of upper / lower nappe
13. Calibration of Ogee Weir.

Assignments for Practical Work (both compulsory)

1. Flow net by graphical method
2. Assignment on use of computer Program/ spread sheet/ solver for Trial and error solution of three-reservoir Problem or Solution of Pipe network By Hardy- Cross Method

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester III)

HS 211 INTRODUCTION TO FOREIGN LANGUAGES

Teaching Scheme: P: 2hrs/week

General Information:

This is a special introductory course of Foreign Language meant for the regular Engineering students of **B. Tech** (3rd Semester) of Shivaji University, Kolhapur.

This course builds the skill sets needed to understand the basics of both language and communication. It is also interested in exploring the relationship between the two categories (language and communication) in order to work out how they relate to each other, it will include introductory concepts in semantics, semiotics, syntax, lexicography, and discourse analysis. It will also include an analysis of philosophical problems of reference, representation, rhetoric, sense, speech acts, and taxtuality. Students will have to submit a term paper and make an oral presentation on any aspect of language and/or communication that they wish to explore at length. Workshops are also included to help students internalize the concepts of communication to which they have been introduced.

AIMS & OBJECTIVES:

1. Introduction of Foreign alphabet, basic Foreign Grammar & Phonetic rules.
2. The Course is aimed at developing the listening, reading and writing skills in the learners.
3. The learner must be able to translate simple texts from and into foreign language.
4. Exposing the learners to simple aspects of life and culture of the foreign people.

SYLLABUS :

Translation:

A passage (approx. 100 words) from Foreign into English/Marathi.

Separate sentences from English into Foreign Language

COMPOSITION:

Simple Grammatical Exercises:

Topics: Recognising ***gender*** of noun, Formation of ***Plural*** noun, Inserting ***pronouns*** in correct forms, ***Conjugation*** of Verbs, Correct use of foreign ***adjectives***, Use of correct **C*ase forms.***

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

CE 221 THEORY OF STRUCTURES - I

Teaching Scheme: L: 4 hrs/week **Credits: 5**

T: 1 hr/week

Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1 **7 hrs**

a) Basic concepts of Structural Analysis – Types and Classification of structure based on structural forms

b) Concept of indeterminacy and degrees of freedom -Static and Kinematic degree of indeterminacy

c) Conjugate Beam method for finding slope and Deflection in determinate Beams

UNIT 2 **6 hrs**

a) Concept of strain energy, strain energy due to axial, due to shear, bending moment and torsional moments

b) Energy Methods in Structural analysis - UNIT Load Method, UNIT Displacement Method, Castigliano's Theorems, Deflection of determinate structures – beams, and rectangular portals

UNIT 3 **7 hrs**

a) Analysis of indeterminate structures , application of Castigliano's Theorem, Beams and Rectangular portal frames

b) Deflections of Determinate Trusses , Castigliano's Theorem

UNIT 4 **6 hrs**

a) Analysis of Indeterminate Beams , Compatibility Methods, Maxwell's theorem of reciprocal displacements and Bett's law

b) Analysis of Redundant Trusses , Castigliano's Theorem

UNIT 5 **7 hrs**

Analysis of indeterminate Structures , Displacement Methods

a) Slope deflection method

b) Moment distribution method

Applications to continuous beams, sinking and rotational yielding at supports with indeterminacy up to 3 degrees.

UNIT 6 **6 hrs**

Influence lines

Basic Concept of Influence lines, construction of Influence line diagrams for support reactions, SF and BM at a given section of beam. Application of Muller-Breslau's principle

Refeerence Books:

1. Beer and Johnston, "Mechanics of Material", Mc Graw Hill publication.
2. Bhavikatti S.S., " Strength of Materials" , New Age Publications
3. C. K. Wang, "Intermediate structural analysis", Mc Graw Hill Publication.
4. C S Reddy, "Basic Structural Analysis, Tata McGraw Hill.
5. F. L. Singer and Pytel, "Strength of Material", Harper and Row publication.
6. Gere and Timoshenko, "Mechanics of Materials" , CBS publishers
7. J.B. Popov, "Introduction to Mechanics of Solids" , Prentice – Hall publication
8. Junnarkar S.B. and Advi, "Mechanics of Structure" (Vol. I & II) , Charotar publication
9. Norris, Wilbur and Utku, "Elementary Structural Analysis", TMH Pub. (4th Edition)
10. Pandit and Gupta, "Theory of Structures" , Tata McGraw Hill Publication
11. Punmia, Jain, " Mechanics of Materials: Vol I & II", Laxmi Publications
12. R.C. Hibbeler, "Structural Analysis", Pearson Education Asia Pub. (5^{th} Edition)
13. S. Ramamrutham, " Strength of Materials" , Dhanapat Rai Publications
14. T.G.H. Megson Structural And Stress Analysis, Arnold Publications.

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

CE 222 ENGINEERING GEOLOGY

Teaching Scheme: L: 3 hrs/week **Credits: 3**

Evaluation Scheme:	CIE	SEE	Minimum Passing Marks
	(25 + 25)	50	40

UNIT 1 **7 hrs**

General Geology & Petrology :

Introduction, Object, Scope & Sub-divisions, General Geology, Surface features, External & Internal Agents modifying the earth, weathering, decomposition, earth movements, metamorphisum, Rock and minerals. Silicate and non-silicate minerals, rock forming minerals, primary and secondary minerals, essential and accessory minerals. Mineral composition of Igneous Rocks, Textures & textural variation, conditions of cooling of plutonic, hypabyssal and volcanic rocks. Classification of igneous rocks. Secondary Rocks processes and products of decomposition and disintegration. Transport and deposition, Classification of Sedimentary Rocks. Agents of transportation. Welding and cementation.

Grain size classification. Agents and types of metamorphism, Metamorphic textures, Contact cataclastic, dynamothermal and plutonic metamorphism. Study of common rock types of Igneous, Sedimentary, Metamorphic rocks as prescribed in practical work.

UNIT 2 **6 hrs**

Structural Geology:

Outcrop. Dip and strike. Conformable series. Unconformity and overlap. Different types of Faults and folds in rocks. Inlier and Outlier. Modes of occurrence of igneous rocks. Joints, Fractures and their engineering characters. Mountains- Mountain building activity, organic and epirogenic processes.

UNIT 3 **7 hrs**

Geomorphology and Historical Geology:

Geological action of running water, river valley development, normal cycle of river erosion, Regional cycle of river erosion, waterfalls, ox-bow lakes, flood plain deposits, delta, Rejuvenation and Resulting features such as canyons, river terraces and incised meanders.

General principles of stratigraphy , Age of the earth and divisions of the Geological time.

Physiographic divisions of India and their characteristics. Geological history of Peninsula.

Study of formations in Peninsula and the significance of their structural characters in major Civil engineering activities, economic minerals.

UNIT 4 **6 hrs**

Ground water, Building Stones and Stability of Slopes:

Types of Ground water, Water table and depth zones of saturation. Influence of textures and Structures of rocks on groundwater storage and movement , Pervious and impervious rocks. Geological work of groundwater, effects of solution and deposition.

Geological conditions favorable for natural springs and seepages, depression and contact Springs. Hot springs and geysers, Artesian wells Water bearing capacity of common rocks, Requirements of good building stone. Dependence of strength, durability, Ease of dressing, availability of blocks of suitable size and appearance on mineral composition Textures and field structures. Suitability of common rocks as building stone.

Causes, Role of water, stability of slopes in consolidated material, influence of dip and slope, safe and unsafe slopes, Prevention of landslides, keeping slopes free from water , retaining walls Vegetation, slope treatment, Precautions to be taken while aligning roads etc. across hills and making cuts in hill slides. Case histories.

UNIT 5 **8hrs**

Preliminary -Geological Explorations and State of Art Techniques in Engineering Geology:

Use of Geological maps and sections. Verification of surface data by subsurface exploration.

Drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts, etc. Compilation and interpretation of information obtained from these, Correlation of surface data with results of subsurface exploration. Limitations of drilling. Comparative reliability of data obtained by drilling and excavation. Engineering significance of Geological structures such as stratification, dips, folds, faults, joints, Fractures, crush zones, fault zones, dykes, etc. Case histories.

Computational Engineering Geology, GIS, Remote Sensing and its applications. Mapping Techniques in Engineering Geology

UNIT 6 **7 hrs**

Tunnelling, Dams and Reservoirs:

Influence of geological conditions on design and construction methods, Preliminary Geological investigations for tunnels. For tunneling . Unlined tunnels. Case histories. Dependence of strength, stability and water tightness of foundation rocks and their physical Characters and Geological structures. Influence of geological condition on the choice of type And design of dams. Preliminary geological work on dam sites. Favourable and unsuitable Geological conditions for locating a dam. Precaution to be taken to counteract unsuitable Condition, Treatment of leaky rocks faults, dykes, crush zones, joints, fractures, unfavourable Dips, etc. Earth quakes in regions of dams. Case histories.

Dependence of water tightness on physical properties and structure of rocks. Geological Conditions suitable and unsuitable for reservoir sits. Conditions likely to cause leakage Through reservoir rims. Importance of ground water studies and effects of raising of the water table. Case histories. Etc.

Earth movements, Earthquakes, Interior of the Earth, earthquake zones, Geological considerations for choosing sites of building in seismic area.

Refeerence Books:

1. A. Holmes, "Principles of Physical Geology", ELBS Chapman & Hall, London.
2. B. S. Sathya Narayanswami, "Engineering Geology", Dhanpat Rai& Co.(P)Ltd, Delhi.
3. D. P. Krynine & W. R. Judd, "Principles of Engineering Geology and Geotechnics", CBS Publishers & Distributors, New Delhi.
4. Dr. D. V. Reddy, "Engineering Geology for Civil Engineering", Oxfard & IBH Publishing Co. PVt. Ltd., New Delhi.
5. Engineering Geology Laboratory Manual.
6. FGH Blyth, and M.H. De Freitas, "Geology for Engineers", ELBS.
7. G. W. Tyrrell, "Principles of Petrology", B. I. Publication Pvt. Ltd., New Delhi.
8. H. H. Read, "Rultey's Elements of Mineralogy", CBS Publishers & Distributors, Delhi.
9. Kiefer and Lilleesand, " Remote Sensing and Image Interpretation"
10. K. V. G. K. Gokhale & D. M. Rao, "Experiments in Engineering Geology", TMN, New-Delhi.
11. L. W. Farmer, "Engineering Properties of Rocks", Champman & Hall, London.
12. M. P. Billings, "Structural Geology", Prentice Hall of India Private Ltd., New Delhi.
13. R. B. Gupte, "A Text Book of Engineering Geology", Vidyarthi Griha Prakashan, Pune.
14. R. F. Legget, "Geology Hand book in Civil Engineering", McGrawHill, New York.
15. Prabin Singh, "Engineering and General Geology", S. K. Katariya and sons, Delhi.
16. Pradeepkumar Guha , " Remote Sensing for Begineers", East West Publications.
17. P. K. Mukerjee , "A Text Book of Geology", The World Press Pvt. Ltd., Calcutta.
18. R.Legget, "Geology and Engineering", McGraw Hill Book Co., London
19. Tood D. K., "Groundwater Hydrology", John Wiley & Son, New York.
20. Thomas Lillesand & Rals Kiffer, "Remote Sensing & Image Interpretation", John Willey & Sons.

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

CE 223 FLUID MECHANICS - II

Teaching Scheme: L: 3 hrs/week **Credits: 4**

T: 1 hr/week

Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1 **6 hrs**

Fluid Flow around Submerged Objects

Practical Problems involving fluid flow around submerged objects; Definitions and expressions for drag, lift, drag coefficient, lift coefficients. Types of drag, Dimensional Analysis of Drag and Lift. Drag on sphere, cylinder, flat plate and aerofoil, Karmann's Vortex Street, Effects of free surface and compressibility on drag, Development of lift on cylinder and aerofoil, Magnus effect, Polar Diagram.

UNIT 2 **7 hrs**

Unsteady Flow

Types of unsteady flow through openings under varying head, Fluid compressibility, Celerity of elastic pressure wave through fluid medium, Water hammer phenomenon, Rise of pressure due to water hammer-rigid water column and elastic water column theories, simple cases neglecting friction.

Rapid acceleration of flow due to sudden opening of valve, Time of establishment of steady state condition of flow. Surge tanks- their functions, location and classification, computation of maximum rise of surge and corresponding time of rise, without friction.

UNIT 3 **6 hrs**

Hydraulic Machinery

Hydraulic Turbines

Hydro-electric power generation, Elements of hydro-electric power plant; Hydraulic turbines; Heads and Efficiencies for Hydraulic Turbines, Classification of Hydraulic Turbines; Theory and design of modern Hydraulic Turbines; Governing of Turbines; Cavitation in Hydraulic Turbines. Performance of Hydraulic Turbines- Prediction of performance in terms of UNIT quantities and specific quantities; Specific speed; Selection of Turbines based on specific speed, Characteristic curves, Dimensional Analysis and Model Analysis as Applied to hydraulic turbines, Turbine model testing, Francis, Kaplan and Pelton Turbines.

Centrifugal and other Pumps

General Classification of Pumps , Centrifugal Pumps and their Classification, Working of Centrifugal Pumps, Priming of Pumps, Theory of Centrifugal Pumps, Centrifugal head impressed due to rotation, Work done , impeller, Heads and Efficiencies, Minimum starting speed, Introduction to the radial type centrifugal pump, Cavitation in centrifugal pumps. Performance of centrifugal pumps, Prediction of performance in terms of specific quantities, Specific speed, Characteristic curves, Dimensional Analysis as applied to centrifugal pumps.

Introduction to reciprocating pump and hydraulic ram. Comparison of centrifugal pump with the other types of pumps, Selection of pumps.

UNIT 4 **7 hrs**

Uniform flow in Open Channels

Introduction to open channel flow: Classification of channels and classification of channel flow-Steady and unsteady, Uniform and non-uniform. Basic equations of fluid flow viz. continuity equation, Bernoulli's Equation and Momentum Equation as applied to channel flow, One-dimensional approach, Geometric Elements of Channel, Velocity Distribution in open channel flow.

Uniform flow in open channels : Characteristics and establishment of uniform flow, uniform flow formulae; Chezy's and Manning's formulae; Factors affecting Manning's Roughness Coefficient, Important terms pertaining to uniform flow viz. normal depth, conveyance, section factor, hydraulic exponent, Uniform flow computations. Most efficient channel section.

UNIT 5 **6 hrs**

Depth- Energy Relationships in Open Channel Flow Specific energy of channel flow; Specific energy diagram, Depth-discharge diagram, Critical depth, Conditions for occurrence of critical flow; Froud's Number and channel flow classification based on it. Important terms pertaining to critical flow viz. section factor, hydraulic exponent; Critical flow computations; Application of Specific energy and critical flow theory to channel transitions.

Specific force; Specific force diagram; depth discharge diagram with respect to specific force; Conditions for occurrence of critical flow with respect to specific force theory. Devices for measurement of velocity and discharge for open channel flow i.e. Current meter, Floats, Venturi flume, Standing wave flume, Stream gauging.

UNIT 6 **7 hrs**

Gradually and Rapidly Varied Flow in Open Channels

Definition and types of non-uniform flow; Gradually Varied Flow (GVF) and Rapidly Varied Flow (RVF); Basic Assumptions of GVF; Differential Equation of GVF- Alternative forms; Classification of channel bed slopes; Zones of GVF profiles;

Various GVF profiles, their general characteristics and examples of their occurrence; Control section; GVF profiles in composite channels.

Gradually varied flow computations; Objectives of GVF computations; Direct step method, Graphical Integration Method, Introduction to advanced methods viz., Standard Step Method and Direct Integration Method, Ven Te Chow Method.

Hydraulic Jump

Phenomenon of Hydraulic jump; Location and examples of occurrence of hydraulic jump; Assumptions in the theory of hydraulic jump; Assumptions in the theory of hydraulic jump; Application of momentum equation to hydraulic jump in rectangular channel; Conjugate depths relation between conjugate depths. Energy dissipation in hydraulic jump; Graphical Method of determination of energy dissipation; Various terms related to hydraulic jump; Classification of hydraulic jump; Practical uses of hydraulic jump.

Note : More emphasis would be given on numericals in the course work.

Refeerence Books:

1. A.K. Jain, " Fluid Mechanics" , Khanna Pub., Delhi
2. K. L. Kumar, " Fluid Mechanics", Eurasia Publication House, Delhi
3. K. Subramanyam, " Flow in open channel", Tata McGraw-Hill Pub. Co., Delhi
4. K. Subramanyam, " Fluid Mechanics", Tata McGraw-Hill Pub. Co., Delhi
5. Modi / seth, " Fluid Mechanics", Hydraulic & Hydraulic Mechanics , Standard Book House, Delhi
6. Rangaraju, "Open Channel flow", Tata McGraw-Hill Pub. Co., Delhi
7. Streeter, " Fluid Mechanics", McGraw-Hill International Book Co., Auckland
8. V. T. Chaw, "Flow in open channel", McGraw-Hill International Book Co., Auckland

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

CE 224 CONCRETE TECHNOLOGY

Teaching Scheme: L: 4 hrs/week **Credits: 4**

Evaluation Scheme:	CIE	SEE	Minimum Passing Marks
	(25 + 25)	50	40

UNIT 1: **9 hrs**

Ingredients of Concrete

a) **Cement:** Physical properties of cement such as fineness, consistency test, Initial and final setting time, soundness, compressive strength, specific gravity. Hydration of cement, chemical compounds of cement. Grades of cement, Types of cement- Ordinary Portland, Portland pozzolana, Rapid Hardening Portland Cement, Quick setting cement, Sulphur resisting cement, Super sulphated cement, Expansive cement, Rediset cement, High strength cement, High Alumina, Low heat, White, Coloured, Oil well, Hydrophobic cement.

b) **Aggregates:** Physical properties such as sieve analysis and fineness modulus, specific gravity and water absorption, silt content, Bulking of sand, Bulk density, moisture content, Flakiness index, Elongation index. Mechanical properties such as Crushing, Impact and Abrasion value, Alkali – Aggregate reaction, Grading of Aggregate, Artificial and recycled aggregate.

c) **Water:** Specifications of water as per IS 456 – 2000.

UNIT 2: **9 hrs**

Fresh Concrete: Batching, Mixing, Transportation, Placing of concrete including pumping and compaction techniques for good quality concrete, Workability of concrete and methods of measuring workability, Factors affecting workability, Segregation and bleeding, Curing of concrete, Different methods of curing, Temperature effects on fresh concrete.

UNIT 3: **6 hrs**

Admixtures: Types of admixtures, Plasticizers and superlasicizers and their effects on workability, Air entraining agents, Retarders, their effects on proportion of concrete, Pozzolanic admixtures, Fly ash, fly ash on fresh concrete, Silica flume, Metalaolim, Ground Granulated Blast Furnace Slag.

UNIT 4: **9 hrs**

Hardened Concrete: Strength of concrete, w/c ratio, Gel-space ratio, Effect of maximum size of aggregate, Factors affecting strength of concrete, Characteristic strength - compressive, tensile and flexure

strength, Relation between compressive & tensile strength. Modulus of elasticity, Relation between modulus of elasticity & strength, Creep and shrinkage of concrete

UNIT 5: 10 hrs

Concrete Mix Design: Nominal Mix Concrete, Objectives of mix design, Factors governing mix design, Methods of expressing proportions, statistically quality control. Mix design , ACI 211.1-91 method, IS code method as per 10262 & 456, DOE method and acceptance criteria

Durability of concrete: Minimum & Maximum cement content, Strength & durability relationship, Volume change in concrete, Impact of w/c ratio on durability, permeability, Exposure to different conditions as per IS 456, Sulphate attack, Alkali aggregate reaction, Chloride attack, Corrosion of steel (chloride induced), Corrosion Control.

UNIT 6 9 hrs

Special concrete: Light weight concrete, No fines concrete, High density concrete, Fibre reinforced concrete and different types, Polymer concrete, High performance concrete, Self compacting concrete, Cold weather concreting, Hot weather concreting, Vacuum concrete, Shotcreting,

Nondestructive testing: Schmidt's rebound hammer – Mechanical & digital, Ultrasonic pulse velocity method, techniques of measuring & factors affecting the measurement of pulse velocity, Corrosion meter, Cover meter.

Referance Books:

1. Handoo, Puri & Kaila, " Concrete Technology" , Satya Prakashan, New Delhi
2. K. T. Krishnaswamy, "Concrete Technology" , Dhanpat Rai Publication,New Delhi
3. M. L. Gambhir, " Concrete Technology" , Tata McGraw-Hill publishing Company Ltd, New Delhi
4. M. Neville, " Concrete Technology" , Pearson Education, New Delhi
5. M. S. Shetty, " Concrete Technology" , S. Chand & Company Ltd, New Delhi
6. Orchard, " Concrete Technology" , Asia publication, New Delhi
7. R. S. Varshnay, " Concrete Technology" , New Chand & Brathers, New Delhi
8. V. N. Vazirani, " Concrete Technology" , Khanna Publication, New Delhi

Referance Codes:

1. IS 456 – 2000 , Plane reinforced concrete
2. IS 10262 – 2007 Doc: CED 2 (7288), Guidelines for Concrete MixProportioning
3. Concrete Mix Design, Code No. 21, All India Council for Technical Education, New Delhi

Shivaji University, Kolhapur

Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

CE 225 BUILDING PLANNING & DESIGN

Teaching Scheme: L: 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1 **8 hrs**

Planning of Residential Buildings, Site Selection criteria. Principles of Building planning. Significance Sun diagram. Wind Diagram. Orientation, Factors affecting, criteria under Indian condition.

UNIT 2 **10 hrs**

Building Planning ,elaws & regulations as per SP-7, 1983 National Building code of India group 1 to 5.

Planning of Residential Building (Bungalows, Row Bungalows, Apartments and Twin Bungalows) Procedure of Building Permission, significance of commencement, plinth completion or occupancy certificate.

UNIT 3 **6 hrs**

Low cost Housing-Materials & Methods (conceptual introduction only) Maintenance, Repairs, Rehabilitation of Structures. (conceptual introduction only)

UNIT 4 **9 hrs**

Building Services

Plumbing system, Various Materials for system like PVC, GI, AC, CI, HDPE, and Stoneware. Various types of traps, Fittings, Chambers, Need of Septic Tank, Concept of Plumbing & Drainage plan, introduction to rainwater harvesting. Concept of rain water Gutters. Rainwater outlet & Down Tank Systems.

Electrification: Concealed & Open Wiring, Requirements & Location of various points, Concept of Earthing.

Fire resistance in building: Fire protection precautions, confining of fire, fire hazards, Characteristics of fire resisting materials, building materials and their resistance to fire.

UNIT 5 **10 hrs**

Ventilation: - Definition and necessity of Ventilation, functional requirement, various system & section criteria.

Air conditioning: - Purpose, Classification, Principles, Systems & Various Components of the same.

Thermal Insulation: - General concept, Principles, Materials, Methods, Computation of Heat loss & heat gain in Buildings.

Introduction to Acoustics: Absorption of sound, various materials, Sabine's formula, optimum reverabaration time, conditions for good acoustics.

Sound Insulation: Acceptable noise levels, Noise prevention at its source, Transmission of noise. Noise control-general considerations.

UNIT 6 **9 hrs**

Building Finishes

Paints: Different types and application methods.

Varnishes & application methods.

Plastering, Pointing & various techniques.

Tile cladding, skirting, dado work with various materials.

Miscellaneous finishes such as POP, sand blasting techniques, wall paper.

Refeerence Books:

1. David Frey, "AutoCAD", BPB Sybex Publications
2. George Omura, " AutoCAD"
3. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
4. Shah, Kale, Patki, " Building Drawing", Tata McGraw- Hill
5. SP 7- National Building Code Group 1 to 5 - B.I.S. New Delhi
6. Y. S. Sane, " Building Design and Drawing", Allied Book Stall, Pune

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Department of Technology

Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

Laboratory-I

CEL 222 ENGINEERING GEOLOGY

Teaching Scheme: P: 2hrs/week **Credit: 1**

Evaluation Scheme: IPE: 50 **Minimum Passing Marks: 20**

Experiments:

1. Megascopic study of Rock forming minerals.
2. Megascopic study of Ore forming minerals.
3. Megascopic study of Igneous rocks.
4. Megascopic study of Secondary rocks.
5. Megascopic study of Metamorphic rocks.
6. Study of geological maps.
7. Study of Structural Geological models.
8. Study tour to the places of Engineering Geological importance.

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Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

Laboratory-II

CEL 223 FLUID MECHANICS - II

Teaching Scheme: P: 2hrs/week **Credits: 1**

Evaluation Scheme: EPE: 50 **Minimum Passing Marks: 20**

Experiments:

Any **eight** of the following :

1. Study of specific energy diagram for different discharges.
2. Study of hydraulic jump

   Verification of sequent depths,

   Determination of loss in jump.

   Plotting the following parameters with respect to Froud number

   i) Y2/Y1 ii) Length iii) Energy loss
3. Study of flow over broad crested weir.
4. Study of flow below gates – Discharge v/s head relation, Equation of flow, Determination of contraction in fluid in downstream of gate.
5. Velocity distribution in open channel in transverse direction of flow
6. Impact of jet
7. Study of Turbines (Demonstration)
8. Test on centrifugal pump
9. Study of charts for selection of pumps

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Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

Laboratory-III

CEL 224 CONCRETE TECHNOLOGY

Teaching Scheme: P: 2hrs/week **Credit: 1**

Evaluation Scheme: EPE: 50 **Minimum Passing Marks: 20**

Experiments:

1. Testing of cement: Consistency, fineness, setting time, Specific Gravity, Soundness and strength.
2. Testing of fine aggregate: Specific Gravity, sieve analysis and zoning, bulking of fine aggregate, bulk density, silt content.
3. Testing of coarse aggregate: Specific Gravity, sieve analysis, bulk density, flakiness index, elongation index, water absorption & moisture content, soundness of aggregate.
4. Concrete Mix design , ACI 211.1-91 method, IS code method as per 10262- 2007 & 456-2000, DOE method Tests on Concrete- Workability tests – Slump cone test, compaction factor test,
5. Vee-bee consistometer test, flow table test, strength tests- compressive strength, flexural strength, split tensile strength.
6. Effects of Admixture - Accelerator, Retarder, Super Plasticizer.
7. Nondestructive Testing - Rebound Hammer test, Ultrasonic Pulse Velocity test.

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Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

Laboratory-IV

CEL 225 BUILDING PLANNING & DESIGN

Teaching Scheme: P: 4hrs/week **Credits: 2**

Evaluation Scheme: IPE: 50 **Minimum Passing Marks: 20**

EPE: 50

1. Imperial size sheet based on actual measurement of existing residential building consisting of plan, elevation, section passing through staircase. Site plan. Area statement & brief specifications.
2. Planning & design of residential building (G+1).
3. Full set of drawings for the building planned in 2- (i) Municipal Submission drawing.
   (ii)Working Drawings:
   - **a)** Foundation / Centre Line Drawing.
   - **b)** Furniture layout plan.
   - **c)** Electrification plan
   - **d)** Water supply & drainage plan.
4. Project report giving details of following systems
   - **a)** Stair Case
   - **b)** Drainage System
   - **c)** Water Supply System
   - **d)** Water Tank
   - **e)** Septic Tank
   - **f)** Design of terrace Drainage System

It shall also consists of the following assignments:

Assignment No. 1

Study of Auto CAD Commands

Assignment No. 2

Preparation of 2D AutoCAD drawing of Project prepared in the practical work of subject Building Planning and Design.

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Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

HS 221 INTRODUCTION TO PERFORMING ARTS

Teaching Scheme: L: 1 hr/week

P: 2 hrs/week

This course will introduce students to problems of performing arts & theatrical representation. It will include readings from ancient & modern performing arts & engage with some of leading theorists. Students will be exposed to the generic difference between different forms of drama / music / dance.

Students will be encouraged to stage scenes from well-known plays / music's / dances as a part of assessments.

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Second Year B. Tech (CIVIL ENGINEERING) (Semester IV)

HS 222 ENVIRONMENTAL STUDIES

Teaching Scheme

Lectures: 2 Hrs/week

Examination Scheme

Theory : 70 Marks

Project : 30 Marks

Terms of References

In pursuance of the verdict of the Hon'ble Supreme Court, (Writ Petition (Civil) No. 72/1998) the University Grants Commission has formed a Committee of experts on Environmental Studies. The Committee has looked into all the pertinent questions, issues and other relevant matters. This was followed , framing of the core module syllabus of Environmental Studies for all undergraduate courses. The UGC has made it compulsory to all universities and colleges in India as per the directives of the Hon'ble Supreme Court of India. (UGC DO No. F.13-1/2000 (EA/ENV/COS-I) 24 July 2002). The Directorate of the Higher Education, Government of Maharashtra through its letter No. NGC/2003/32224/MV-1, Higher Education, 14 January 2004 has also made it compulsory to comply with the decision of Hon'ble Supreme Court.

Hon'ble Vice-Chancellor has endorsed the scheme to the Dean of Social Science faculty for designing the Course Curricula. Accordingly it has been studied thoroughly and the Scheme of its implementation has been prepared & forwarded to the colleges.

Vision

The importance of environmental science and environmental studies cannot be disputed. The need for sustainable development is a key to the future of mankind. Continuing the problems of pollution, loss of forest, solid waste disposal, degradation of environment, issues like economic productivity and national security, global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues. The United Nations Conference on World Summit on Sustainable Development at Johannesburg in 2002 have drawn the attention of people around the globe to the deteriorating condition of our environment. It is clear that no citizen of the earth can afford to be ignorant of environmental issues. Environmental management has captured the attention of health care managers. Managing environmental hazards has become very important.

Human beings have been interested in ecology since the beginning of civilization. Even our ancient scriptures have emphasized about practices and values of environmental conservation. It is now even more

critical than ever before for mankind as a whole to have a clear understanding of environmental concerns and to follow sustainable development practices.

India is rich in biodiversity which provides various resources for people. It is also the basis for biotechnology.

Only about 1.7 million living organisms have been described and named globally. Still many more remain to be identified and described. Attempts are made to conserve them in ex-situ and in-situ situations. Intellectual property rights (IPRs) have become important in a biodiversity-rich country like India to protect microbes, plants and animals that have useful genetic properties. Destruction of habitats, over-use of energy resources and environmental pollution have been found to be responsible for the loss of a large number of life-forms. It is feared that a large proportion of life on earth may get wiped out in the near future.

Inspite of the deteriorating status of the environment, study of environment has sofar not received adequate attention in our academic programmes.

Recognizing the significance of the Environmental Studies, as a new paper has to be introduced at the Second Year Degree Course in all faculties.

Application

A new paper on Environment Studies has been introduced at all the Second Year Degree Course as a compulsory certificate course in Environment Studies from the academic year 2005-06 with a duration of six months. The examination will be conducted during the second term of the academic year. The total marks allotted to this course is 100 mark including a field work reporting of 30 Marks.

There will two streams of the students offering to this course.

a) One will be of self-study in nature. Reading material will be supplied to a student , the University. Each student offering this stream has to attend 20 contact periods spread in six months of the first term and has to pay a fee of Rs. 150/-. The honorarium of these contact lectures will be paid , the college out of the fees collected at the rate of Rs. 100/- per lecture hour. Out of the collected Rs. 50/- should be transferred to the University.
b) The students offering to another stream has to pay Rs. 250/- as fee of the course. Under the stream students will be taught as per the syllabus, regularly in 40 lecture hours, plus 10 hours of field work. Out of the fees collected Rs. 50/- per student has to be transferred to the University. The remaining amount can be used for payment of honorarium to a teacher teaching the said course at the rate or Rs. 100/- per lecture.
c) The external students have to appear for the said certificate course.
d) The Project Report has to be submitted as per the guideline given below.

e) The field project is to be carried out individually , every student under the supervision of the concerned teacher. The project topic is expected to be on the local/ regional environmental issue. the project theme is to be essentially need based, time bound (six months) and result / action oriented. Model topics/ themes along with methodology will be given in the resource material of the course.

The project report is to be prepared as per the prescribed format, in typed form and with spiral binding. The project report is to be submitted prior to the written examination. Central evaluation procedure is to be followed for the assessment of the project reports.

Examination Pattern

In the case of awarding the marks, the question paper will carry 100 marks. The structure of the question paper being:

1	Objective/To the point./Exercise Type answers	10 marks
2	Short answer pattern (3 out of 5)	15 marks
3	Short Notes (3 out of 5)	15 marks
4	Essay type questions with internal choice (one question of 10 marks shall be on field work)	30 marks
5	Field Work Reporting	30 marks

Field Work Reporting

A format of field work Report shall be of the following in nature.

Cover Page :	Name of the College and Department Title of the Project Name of the Student Name of the Supervisor Year of Submission	**Content Page** :	Contents List of Tables, Diagrams, Figures, Photographs etc.
Second Page	Declaration of the Student	**Chapter – I** :	Research Methodology
Third Page	Certificate of the Supervisor (countersigned by the Head & Principal)	**Chapter – II** :	Reporting
		Last Chapter :	Summary and Findings Bibliography

The field work reporting will be the exclusive work of the students to be submitted under the guidance of the Department faculty. The reports will be assessed , the Panel of Examiners in the respective subjects prepared , the BOS and approved , the 32 (5) and BOE.

Medium of Instruction

The medium of instruction for Law, Science, Medical and Engineering faculties will be English and for Arts, Social Sciences and Commerce medium of instruction will be English or Marathi.

Qualifications of the Teacher

The paper is to be taught in 4 lectures per week. The qualifications to teach the paper of the teachers will be as under:

1. P. G. with B+ in Environment Science

2. If qualified teacher is not available initially, temporary arrangements can be made from the permanent teachers, who has published work or expository articles or books written on Environmental Studies or completed workshops/refresher course/training programme of three weeks duration on Environmental Studies.

Declaration of the Result, Issuing of the Certificate, Re-appearing for the Examination and Grades.

1 The certificate course can be cleared in the third year. If candidate remains absent or fails in the course in the second year of the degree course.

2 The candidate will have to pass in the examination of the certificate course in Environmental Studies in order to obtain degree certificate from the University.

3 Results of the theory examination will be declared only after submission of the field work report to the college.

4 A candidate has to pass this paper in order to obtain degree certificate. If the candidate passes in all subjects of degree course but fails in this paper, he will not obtain degree certificate.

5 The marks obtained , a student will be converted into grades as bellow

Grade 0 - above 75

A - 61 to 75 B - 51 to 60 C - 40 to 50

6. Certificate with grade obtained will be issued , the University.

7. The scheme is made applicable start from a academic year 2005-06 for second year students of all faculties.

8. The Principal can appoint Course Coordinator to organize teaching and evaluation.

SYLLABUS

1. Nature of Environmental Studies

Definition, scope and importance. (2 lectures)

Multidisciplinary nature of environmental studies

Need for public awareness.

2. Natural Resources and Associated Problems.

a) Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources: Usage and exploitation, environmental effects of extracting and using mineral resources.

d) Food resources: World food problem, changes caused , agriculture effects of modern agriculture, fertilizer-pesticide problems.

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

g) Role of an individuals in conservation of natural resources. (8 lectures)

h) Equitable use of resources for sustainable lifestyle.

3. Ecosystems

- 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, characteristics features, structure and function of the following ecosystem:-

a) Forest ecosystem,

b) Grassland ecosystem,

c) Desert ecosystem,

d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) (8 Lectures)

4. 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 at global, National and local levels.
- India as a mega-diversity nation.
- Western Ghat as a bio-diversity region.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. (8 Lectures)

5. Environmental Pollution

Definition : Causes, effects and control measures of:

a) Air pollution,

b) Water pollution,

c) Soil pollution,

d) Marine pollution,

e) Noise pollution,

f) Thermal pollution,

g) Nuclear hazards

• Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

• Role of an individual in prevention of pollution.

• Pollution case studies

• Diaster management : Floods, earthquake, cyclone and landslides. Tsunami (8 Lectures)

6. 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.

• Environmental ethics: Issue and possible solutions.

• Climate change, Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

• Wasteland reclamation.

• Consumerism and waste products. (8 Lectures)

7. Environmental Protection

• Environment Protection Act.

• Air (Prevention and Control of Pollution) Act.

• Water (Prevention and control of Pollution) Act

• Wildlife Protection Act

• Forest Conservation Act

• Population Growth and Human Health, Human Rights. (8 Lectures)

8. Field Work (10 Lectures)

- Visit to a local area to document environmental assetsriver/ forest/grassland/hill/mountain or
- Visit to a local polluted site – Urban/rural/Industrial/Agricultural or
- Study of common plants, insects, birds. or
- Study of simple ecosystems-ponds, river, hill slopes, etc.

(Field work Equal to 10 lecture hours)

Total = 60 hours

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