COURSE STRUCTURE AND SYLLABUS

FOR B. ARCH. (OFFERED BY CE DEPT)

In the new BArch course structure, there are 7 subjects to be offered by the Civil Engineering Department, as listed below:

1. CE 1202: Fundamentals of Ecology and Environmental Pollution - 2nd sem
2. CE 2118: Surveying - 3rd sem
3. CE 2117: Structural Analysis - 3rd sem
4. CE 2217: Design of Reinforced Concrete Structures - 4th sem
5. CE 2287: Surveying Practice - 4th Sem
6. CE 3117: Design of Steel Structures –5th sem
7. CE 3287: Structure Project on Analysis and Design of Buildings - 6th sem

SL. No.	Semester	Course Name	Course Code	Class Load /Week			Credit	Class load /week	Marks
				L	T	P			
1.	2nd	Fundamentals of Ecology and Environmental Pollution	CE 1202	2	0	0	2	2	50
2.	3rd	Surveying	CE 2118	2	0	0	2	2	50
3.	3rd	Structural Analysis	CE 2117	3	0	0	3	3	100
4.	4th	Design of Reinforced Concrete Structures	CE 2217	3	0	0	3	3	100
5.	4th	Surveying Practice	CE 2287	0	0	3	2	3	50
6.	5th	Design of Steel Structures	CE 3117	3	0	0	3	3	100
7.	6th	Structure Project on Analysis and Design of Buildings	CE 3287	0	0	3	2	3	100

2nd Semester

CE 1202: Fundamentals of Ecology and Environmental Pollution

Full Paper: 2 – 0 – 0 (L – T – P) **Full Marks: 50** **Credit: 2**

Course Objective: To provide the students with basic understanding about the environment and its allied problems, and identify and solve environmental problems.

Course Outcome: At the end of the course, the students will be able to:

1. Understand the different components of the environment and functional and structural attributes of the ecosystem.
2. Correlate the effects of environmental pollution with the changes in the ecosystem.
3. Understand the reasons of environmental pollution
4. Acquire the knowledge solving the environmental problems
5. Acquire the knowledge about conducting environmental impact assessment

Syllabus: Introduction, ecology, water and wastewater, basics of air pollution, solid waste management, noise pollution, environmental impact assessment.

Sl. No.	Description of Course Modules and Lecture Plan	No. of lectures
1.	Introduction: Need for environmental studies; Resources; Sustainable development – definition/goals,	2
2.	Ecology: Definition of environment, biosphere, ecology, ecosystem; Components of environment, Biosphere, Ecosystem; Major types of ecosystem on earth, food chain and energy flow; Ecological pyramid; Biomagnification; Biogeochemical cycles; Biodiversity etc.	6
3.	Water and Wastewater: Sources; Quality; Treatment standards; Conservation and recycling water crisis and related issues	6
4.	Basics of Air Pollution: Definition; Sources; Classification; Effects on environment; Global effects; Relation between meteorological parameters and air pollution; Basic control strategies of air pollution	5
5.	Solid Waste Management: Definition; Generation of SW; Components; Engineered system for SWM – generation, in-site process, collection; transfer and transport, processing, disposal.	3

6.	Noise Pollution: Definition; Characteristics of sound; Measurement; Control of noise pollution	2
7.	Environmental Issues: EIA, environmental audit, water and air pollution lows	2
	Total	26

Suggested Readings:

1. Peavy, H. S., Rowe, D. R., and Tchobanoglous, G. (1985), "Environmental Engineering", McGraw Hill Book Company, Singapore.
2. Masters, G.M. (1995), "Introduction to Environmental Engineering and Science", Second Indian Reprint, Prentice Hall, New Delhi.
3. Kormondy, E. J. (1999), "Concepts of Ecology", Prentice-Hall.
4. Rajagopalan, R. (2011), "Environmental Studies – from Crisis to Cure", Oxford University Press, 2nd Ed.

3rd Semester

CE 2118: Surveying

Weekly Contact: 2 – 0 – 0 (L – T – P) **Full Marks: 50** **Credit: 2**

Course Objective: To provide the students with a basic understanding of principles of field surveying procedures and practices for engineering applications. The course also intends to impart basic knowledge on various topics of advanced surveying: for example, photogrammetry, Global Positioning Systems (GPS) and land use mapping.

Course Outcome: In this course, students will gain a theoretical and applied understanding of surveying principles and practices. The course learning outcome are:

1. Measurement of distance using tape or EDM and angle using compass and theodolite
2. Profile levelling and contouring using levelling instruments
3. Principles and practices used in triangulation, traversing and plane table surveying
4. Surveying through Total Station equipment
5. Land use mapping using aerial survey

Syllabus: Basic concepts of surveying, distance measurement, angle measurement, levelling, conventional surveys, plane table surveying, total station surveying, geomatics engineering.

Sl. No.	Description of Course Modules and Lecture Plan	No. of lectures
1.	Basic concepts of surveying: Principles – Basic measurements – Control networks – Locating position - Errors in measurement	3

2.	Distance measurement: Principles and methods – Errors in taping and chaining – Electromagnetic Distance measurement (EDM) – measuring principles – errors, checking and calibration.	3
3.	Angle measurement: Measurement with compass and theodolite – methods of measurements – instrument adjustment – sources of error.	2
4.	Levelling: Principles of levelling – equipment – effect of curvature and refraction – simple and differential levelling - adjustments – Contouring - Tacheometry – Different types of tacheometric measurements - fixed hair and tangential method	5
5.	Conventional surveys: traversing – plane rectangular coordinates – development of triangulation network – method of triangulation – traversing	2
6.	Plane table surveying: different methods - two and three-point problems	2
7.	Total station surveying: principles – classification – salient features of total station – adjustments	4
8.	Geomatics Engineering: the concept of GPS - principles – errors – GPS survey methods - planning of GPS survey - aerial surveying – photogrammetry – stereoscopy - land use mapping	5
	Total	26

Suggested Readings:

1. Ghosh, J. K. (2010), “Elementary Engineering Surveying”, Studium Press (India) Pvt Ltd.
2. Duggal, S. K. (2013), “Surveying (Vol. 1, Vol 2)”, Tata McGraw-Hill Education India
3. Subramanian, R. (2013), “Surveying and Leveling”, Oxford University Press
4. Roy, S. K. (2010), “Fundamentals of Surveying”, Prentice Hall India Learning Private Limited
5. Bossler, J.D. (2010), “Manual of Geospatial Science and Technology”, Taylor and Francis.

3rd Semester

CE 2117: Structural Analysis

Weekly contact: 3 – 0 – 0 (L – T – P) **Full Marks: 100** **Credit: 3**

Course Objective: 1. To equip the candidates with basic tools of structural analysis, 2. To provide an idea of structural behavior, and 3) To introduce numerical methods of structural analysis so that the candidate can use the knowledge in future research and software analysis.

Course Outcome: At the end of the course, the students will be able to:

- Students will have a clear idea about structural indeterminacy, degree of freedom and behavious of various structural systems.
- The students will be able to analyze basic structural elements for practical design and architectural planning,
- Students will become familiar with numerical methods of structural analysis (such as finite element method) and use this concept for software analysis of structure. This will also help them for future research.

Syllabus: Structural redundancy, degree of freedom, analysis of statically determinate and indeterminate structure to obtain internal forces and displacement of structure. Introduction to numerical methods like finite element method.

Sl. No.	Description of Course Modules and Lecture Plan	No. of lectures
1.	Introduction to statically determinate and indeterminate structures, degree of redundancy, degree of freedom, force and displacement methods, static and dynamic load	4
2.	Fundamentals of analysis of determinate structure: Conjugate beam method, Strain energy method, Castiglianos theorem, calculation of force effect, rotation and deflection of beam and truss.	9
3.	Fundamentals of analysis of indeterminate structure: consistent deformation method, moment distribution method, slope deflection method, analysis of portal frames, elementary analysis of continuous beam curved in plan	18
4.	Introduction to matrix stiffness method	4
5.	Introduction to finite element method	4
	Total	39

Suggested Readings

1. Hibbler, R. C. (2017), “Structural Analysis”, PHI
2. Ramamruthan, S, and Narayan, R. (2014), “Theory of structures”, Dhanpat Rai Pub.
3. Roy, S.K., and Chakraborty, S. (2011), “Fundamentals of Structural Analysis”, S Chand
4. Thandavamoorthy, T.S. (2011), “Structural analysis”, Oxford Pub.

4th Semester

CE 2217: Design of Reinforced Concrete Structures

Weekly contact: 3 – 0 – 0 (L – T – P) **Full Marks: 100** **Credit: 3**

Course Objective: 1.To enable the candidates with basic design approaches for beam, slab, column and foundation, 2. To impart knowledge about prestressed concrete for effective planning and design of architectural systems, 3. To equip the candidate with ductile detailing and sizing requirements of structural elements for sustainable planning of structures under earthquake load .

Course Outcome: At the end of the course, the students will be able to:

- Students will be able to design elementary structural elements like beam, slab, column and foundation.
- Students will have ideas to design more complex and innovative structural systems with architectural appeal. They will also have ideas on prestressed concrete structures that will help them in planning with modern technologies.
- Students will effectively provide sustainable planning solutions for aseismic structures.

Syllabus: Design and detailing of elementary structural elements (beam, column, slab, foundation), Introduction to prestressed concrete structure design and ductile detailing concept.

Sl. No.	Description of Course Modules and Lecture Plan	No. of lectures
1.	Introduction to various loading on structures; design philosophies of working stress method and limit state method	5
2.	Design and detailing of singly reinforced and doubly reinforced beam, concept of development length, anchorage, lintel and chajja, Use of SP-16	7
3.	Design and detailing of one-way and two-way slab, concept of torsion steel in two-way slab, deflection criteria	6

4.	Design and detailing of axially loaded column, Introduction to long column and bi-axial bending, use of SP-16	4
5.	Design and detailing of isolated footing under axial and eccentric load, combined footing	5
6.	Introduction to design of pile, pile-cap, raft, grid slab, shells	6
7.	Introduction to prestressed concrete	3
8.	Ductile detailing provisions for design under earthquake	3
	Total	39

Relevant IS codes:

1. IS: 456 (2000), "Plain and Reinforced Concrete - Code of. Practice", BIS
2. SP 16 (1980), "Design Aids for Reinforced Concrete to IS 456:1978", BIS.
3. IS: 875 part I and II (1987), "Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures. Part 1: Dead Loads, Part 2: Live load", BIS.
4. SP: 34(1987) " Handbook on Concrete Reinforcement and Detailing", BIS.
5. IS 1893-Part 1:(2016) "CRITERION FOR EARTHQUAKE RESISTANT. DESIGN OF STRUCTURES. Part 1 General Provisions and Buildings." (Sixth Revision), BIS
6. IS 13920 (2016). "Indian Standard. DUCTILE DETAILING OF REINFORCED. CONCRETE STRUCTURES", BIS

Suggested Readings:

1. Menon, D., and Pillai, S. (2017), "Reinforced concrete Design", Mc Graw Hill
2. Subramaniam, N. (2013), "Design of Reinforced concrete Structures", Oxford University Press
3. Bandyopadhyay, J.N. (2008), "Design of Concrete Structures", PHI
4. Verghese, P.C. (2008), "Limit state design of Reinforced Concrete", PHI

4th Semester

CE 2287: Surveying Practice

Weekly contact: 0 – 0 – 3 (L – T – P) **Full Marks: 50** **Credit: 2**

Course Objective: To provide the students with a basic understanding of principles of field surveying procedures and practices for engineering applications.

Course Outcome: In this course, students will gain applied understanding of surveying principles and practices. The course learning outcome are:

- Measurement of distance using tape or EDM and angle using compass and theodolite
- Profile levelling and contouring using levelling instruments
- Principles and practices used in triangulation, traversing and surveying through Total Station equipment

Syllabus: Introduction, chain triangulation, traversing with prismatic compass, profile levelling with dumpy level, contouring, theodolite traverse, total station and measurements, setting out buildings, setting out highway curves.

Sl. No.	Description of Course Modules and Lecture Plan	No. of lectures
1.	Introduction - surveying equipment - basic measurement	3
2.	Chain Triangulation - Plotting the chain triangulation of a given area	3
3.	Traversing with Prismatic Compass - Plotting the compass traverse of a given area and graphical adjustments	3
4.	Profile levelling with Dumpy level - Longitudinal sectioning and cross-sectioning	6
5.	Contouring - preparation of contour map of a given area	6
6.	Theodolite traverse – theodolite traversing and plotting the results graphically	6
7.	Total station and measurements - Surveying through Total Station equipment	6
8.	Setting out buildings	3
9.	Setting out highway curves	3
	Total	39

Suggested Readings:

1. Ghosh, J. K. (2010), "Elementary Engineering Surveying", Studium Press (India) Pvt Ltd.
2. Duggal, S. K. (2013), "Surveying (Vol. 1, Vol 2)", Tata McGraw-Hill Education India
3. Subramanian, R. (2013), "Surveying and Leveling", Oxford University Press
4. Roy, S. K. (2010), "Fundamentals of Surveying", Prentice Hall India Learning Private Limited

5th Semester

CE 3117: Design of Steel Structures

Weekly contact: 3 – 0 – 0 (L – T – P) **Full Marks: 100** **Credit: 3**

Course Objective: 1.To equip the students with basic design methods of elementary steel structures. 2. To enable the students to understand behaviour of steel structural systems and failure modes. 3. To make them familiar with advanced steel structural systems for cost-effective planning

Course Outcome: At the end of the course, the students will be able to:

- Students will be able to design elementary steel structural elements.
- Students will gain knowledge of modern steel structural systems for effective use in architectural planning.
- Students will be able to visualize the behaviour and failure modes of steel structures.

Syllabus: Design and drawing of elementary steel structural elements (tension member, compression member, connection, beam, column, base plate), Introduction to plate girder, bracing and Vierendeel girder.

Sl. No.	Description of Course Modules and Lecture Plan	No. of lectures
1.	Limit state method and working stress method for design of steel structures, various cross-sectional forms of steel structures, section-classifications	4
2.	Design of truss members, tensile and compressive strength, buckling of column	7
3.	Design of axially loaded welded and bolted connections, Introduction to eccentric connections, truss-end connections and beam-end connections	7
4.	Design of simple laterally supported beams, laterally unsupported beams	7

5.	Design of column, base plate under axial load; Introduction to design of beam-column and gusseted base subjected to axial force and moment	8
6.	Introduction to design of plate girder, lacing, batten, bracing, Vierendeel girder	6
	Total	39

Relevant IS codes:

1. IS 800 (2007). "Indian Standard. GENERAL CONSTRUCTION IN. STEEL — CODE OF PRACTICE." BIS.
2. SP 6-1 (1964), "ISI Handbook for Structural Engineers -Part- 1 Structural Steel Sections", BIS.

Suggested Readings:

1. Subramanian, N. (2015), "Design of Steel Structures", Oxford Higher Education
2. Duggal, S.K. (2014), "Design of steel structures", Tata MCGraw Hills

6th Semester

CE 3287: Structure Project on Analysis and Design of Buildings

Weekly contact: 0 – 0 –3 (L – T – P) **Full Marks: 100** **Credit: 3**

Course Objective: 1. To train the students with modern software tools for structural analysis and design, 2. To impart a comprehensive idea to the students about estimation of various load effects on structures, 3. To train the student about detailing of structural elements with ductile detailing with and without software

Course Outcome: At the end of the course, the students will be able to:

- Students will be able to analyze and design structural systems using contemporary software.
- Students will be able to produce detailing of structure with and without using contemporary software.

Syllabus: Estimation of load, hands-on training on structural analysis and design using contemporary software, Detailing of structural members.

Sl. No.	Description of Course Modules and Lecture Plan	No. of lectures
1.	Estimation of dead load, live load, wind load and	10

	earthquake load on a multi-storied building	
2.	Computer aided analysis and design of the multi-storied building	19
3.	Detailing of structural elements of the building including ductile detailing	10
	Total	39

Relevant IS codes:

1. IS: 456 (2000), “Plain and Reinforced Concrete - Code of. Practice”, BIS
2. SP 16 (1980) “Design Aids for Reinforced Concrete to IS 456:1978”, BIS.
3. IS: 875 part I, II, and III (1987) “Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures. Part 1: Dead Loads, Part 2: Live load, Part 3: Wind load”, BIS.
4. SP: 34(1987) “Handbook on Concrete Reinforcement and Detailing”, BIS.
5. IS 1893-Part I (2016) “CRITERION FOR EARTHQUAKE RESISTANT. DESIGN OF STRUCTURES. Part 1 General Provisions and Buildings. (Sixth Revision)”, BIS
6. IS 13920 (2016) “Indian Standard. DUCTILE DETAILING OF REINFORCED. CONCRETE STRUCTURES”, BIS