



Estd. 1962  
NAAC 'A' Grade  
MHRD-NIRF- 28<sup>th</sup> Rank

SHIVAJI UNIVERSITY, KOLHAPUR-416 004. MAHARASHTRA

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दुरध्वनी (ईपीएबीएक्स) २६०९००० (अभ्यास मंडळे विभाग- २६०९०९४)

फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.e-mail:bos@unishivaji.ac.in

SU/BOS/Sci. & Tech/

No 0 0 3 5 8

Date: 15/09/2021

To,

17 SEP 2021

The Principal/ Director,  
All affiliated Engineering Colleges/ Institute,  
Shivaji University, Kolhapur.

**Subject :** Regarding revised Syllabus and equivalence of CBCS Final Year B.Tech.  
Part-IV Sem-VII-VIII Program under Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the University Authorities have accepted and granted approval to structure and Syllabus of CBCS Final Year B.Tech. Part-IV Sem-VII-VIII under the Faculty of Science & Technology.

**B. Tech. Programme (Branch)**

1.	Civil Engineering & Technology
2.	Mechanical Engineering & Technology .....
3.	Electrical Engineering & Technology
4.	Chemical Engineering & Technology
5.	Electronics Engineering & Technology
6.	Electronics and Telecommunication Engineering & Technology
7.	Computer Science Engineering & Technology
8.	Information Technology Engineering & Technology
9.	Production

This revised syllabus and equivalence shall be implemented with effect from the academic year 2021-2022 (i.e. from June 2021) onwards. A soft copy containing syllabus is attached herewith and it is available on university website [www.unishivaji.ac.in](http://www.unishivaji.ac.in).

The question papers on the pre-revised syllabi of above mentioned course will be set for the examinations to be held in October /November 2021 & March/April 2022. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dy. Registrar

Copy to:

1	The I/c Dean, Faculty of Science & Technology	7	Computer Centre
2	The Chairman, Respective Board of Studies	8	Affiliation Section (T.1)
3	Director, Examination and Evaluation	9	Affiliation Section (T.2)
4	Eligibility Section	10	P.G.Admission Section
5	O.E. - 4	11	P.G Seminar Section



SHIVAJI UNIVERSITY, KOLHAPUR

FINAL YEAR (B.Tech.) CBCS

In

CIVIL ENGINEERING

(To be implemented from JUNE 2021)

# Final Year Civil Engineering - CBCS Pattern

SEMESTER– VII																								
Sr.No	Course( Subject Title)	TEACHINGScheme									EXAMINATIONScheme													
		THEORY				TUTORIAL				PRACTICAL			THEORY					PRACTICAL			TERMWORK			
		Credits	No. of Lectur e	Hours		Credits	No. of Lectur e	Hours		Credits	No. of Lectur e	Hours	Hours	Mode	Marks	Total Marks	Min	Hours	Max	Min	Hours	Max	Min	
1	PCC-CV701	4	4	4		-	-	-		1	2	2			CIE	30	100	40	AsperBOSGuidelines	-	-	2	25	20
2	PCC-CV702	3	3	3		1	1	1		-	-	-			ESE	70				-	-	2	25	10
3	PCC-CV703	3	3	3		-	-	-		1	2	2			CIE	30	100	40		25	10	2	25	10
4	PCC-CV704	3	3	3		-	-	-		1	2	2			ESE	70				25	10	2	25	10
5	PCE-CV705	3	3	3		-	-	-		1	2	2			CIE	30	100	40		25	10	2	25	20
6	PCC-CV706	2	2	2		-	-	-		1	2	2			ESE	70				25	10	2	25	20
7	SI-CV707	-	-	-		-	-	-		-	-	-			CIE	30	100	40		25	10	2	25	20
8	PW-CV708	-	-	-		-	-	-		1	2	2			ESE	70				-	-	2	50	20
	TOTAL	18	18	18		2	2	2		5	10	10				500			75		225			
SEMESTER –VIII																								
1	PCC-CV801	4	4	4		-	-	-		1	2	2			CIE	30	100	40	AsperBOSGuidelines	-	-	2	25	10
2	PCC-CV802	3	3	3		-	-	-		1	2	2			ESE	70				-	-	2	25	10
3	PCC-CV803	3	3	3		-	-	-		1	2	2			CIE	30	100	40		-	-	2	25	10
4	PCE-CV804	3	3	3		1	1	1		-	-	-			ESE	70				-	-	-	-	-
5	PCE-CV805	3	3	3		1	1	1		-	-	-			CIE	30	100	40		-	-	-	-	-
6	PCC-CV806	-	-	-		-	-	-		2	4	4			ESE	70				25	10	2	50	10
7	PW-CV807	-	-	-		-	-	-		1	2	2			-	-	-	-		100	40	2	50	20
	TOTAL	16	16	16		2	2	2		7	14	14				500				125		175		
	TOTAL	35	35	35		3	3	3		12	24	24				1000			200		400			

SEMESTER-VII					
Sr. No	CodeNo.	Course(SubjectTitle)		Semester	Credits
1	PCC-CV701	DCS-I	Design of Concrete Structures-I	7	5
2	PCC-CV702	EQ	Earthquake Engineering	7	4
3	PCC-CV703	QSV	Quantity Survey and Valuation	7	4
4	PCC-CV704	TR-I	TransportationEngineering-I	7	4
5	PCE-CV705	EL-I	Professional Elective-I	7	4
6	HM-CV706	LACE	Legal Aspect in Civil Engineering	7	3
7	SI-CV707	FT	Field Training	7	-
8	PW-CV708	PP-I	Project Phase-I	7	1
TOTAL					25

SEMESTER-VIII					
Sr. No	CodeNo.	Course(SubjectTitle)		Semester	Credits
1	PCC-CV801	DCS-II	Design of Concrete Structures-II	8	5
2	PCC-CV802	WRE-II	WaterResourceEngineering-II	8	4
3	PCC-CV803	TR-II	TransportationEngineering-II	8	4
4	PCE-CV804	EL-II	Professional Elective-II	8	4
5	PCE-CV805	EL-III	Professional Elective-III	8	4
6	PCC-CV806	SDD-II	StructuralDesignandDrawing-II	8	2
7	PW-CV708	PP-II	Project Phase-II	8	2
TOTAL					25

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**DESIGN OF CONCRETE STRUCTURES-I**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Total credit	Scheme	Theory (Marks)		Practical (Marks)	
<b>Design of Concrete Structures-I (PCC-CV701)</b>	4	-	2	5		Max	Min for Passing	Max	Min for Passing
					ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE – In Semester Evaluation    CIE – Continuous Internal Evaluation    ESE – End Semester Evaluation

**Course Objective:**

1. To understand the concept of RCC structural design
2. To conceive the elementary design of different structural elements.
3. To impart knowledge of strength determination of different kinds of R.C. elements using I.S. Code.

**Course Outcome:** After successful completion of this course student will be able to

1. Understand the basic data (Basic Mechanics, Mathematics, and structural analysis) required for design of concrete structures.
2. Understand the design process of concrete structure
3. Understand the application of limit state method for structural element such as footing, column, beam slab, staircase etc.
4. Design the individual members and hence building.

**SECTION- I**

**Unit: 1(06)**

Introduction to R.C.C., Stress-Strain behavior of concrete, Steel and R.C.C, Different design philosophies, Various Limit States, Characteristic Strength and Characteristic Load, Load Factor, Partial Safety Factors.

**Unit: 2(10)**

Limit State of Collapse (Flexure) - Analysis and design of singly reinforced beam. Analysis and design of doubly reinforced beam, Analysis and design of symmetrical T and L beams.

**Unit: 3(08)**

Limit state of collapse (shear and bond): Shear failure, Types of Shear reinforcement, Design of Shear reinforcement, Bond-types, Factors affecting bond Resistance, Check for development length. (No Numericals on bond)

**SECTION- II**

**Unit: 4 (08)**

a) Design of slabs: Cantilever Slab, Simply Supported One way slab, Simply Supported Two way slab with different support conditions as per IS:456-2000

b) Design of Simply Supported single flight and Doglegged staircase.

**Unit:5 (08)**

Design of Columns - General aspects, Effective length of column, Loads on column, Slenderness ratio for column, Maximum and Minimum eccentricity, Codal provisions, Design of short axially loaded columns, Design of columns subjected combined axial load and uniaxial bending using SP-16.

**Unit : 6 (08)**

Design of isolated rectangular column footing with constant depth subjected to axial load and moment.

**Term work:** At least one assignment on each unit consisting of four questions.

**Text books:**

1. IS 456-2000, SP-16 & Relevant Special publications of BIS
2. Limit state theory and Design – Karve and Shah, Structures publications, Pune
3. Reinforced Concrete Design – Limit state – A.K. Jain Nem Chand brothers, Roorkee
4. Fundamentals of Reinforced Concrete – Sinha and Roy, S. Chand and company Ltd. Ram Nagar, New Delhi
5. Reinforced Concrete Design – B.C. Punmia Laxmi publications New Delhi
6. Reinforced Concrete Design – M. L. Gambhir – Mc millan India Ltd. New Delhi

**Reference Books**

1. Limit State Design of Reinforced Concrete P.C. Varghese, Prentice Hall, New Delhi

**Guidelines regarding question paper setting:**

1. Section – I – Q.No-1 to Q.No-3 and Section – II – Q.No-4 to Q.No-6
2. All questions are Compulsory.
3. Internal option question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks

**END SEMESTER EXAMINATION PAPER PATTERN**

Question No.	Based on Unit No.	Marks
1	1	12
2	2	12
3	3	11
4	4	12
5	5	12
6	6	11

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**EARTHQUAKE ENGINEERING**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Total credit	Scheme	Theory (Marks)		Practical (Marks)	
<b>Earthquake Engineering(PCC-CV702)</b>	3	1	-	4		Max	Min for Passing	Max	Min for Passing
					ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE – In Semester Evaluation    CIE – Continuous Internal Evaluation    ESE – End Semester Evaluation

**Course objectives:**

1. To understand interior of earth and behavior of earth during earthquake.
2. To understand the concepts of mathematical modeling.
3. To understand dynamic behavior of structure.
4. To understand earthquake resistant philosophy of structure.
5. To understand modern techniques of earthquake resistant method.

**Course Outcomes:** After successful completion of course student will be able to

1. Prepare mathematical modeling of Single Degree of Freedom System.
2. Design earthquake resistant structure by applying various codal provisions related to seismic design
3. Know the concept of modern earthquake resistant techniques

## **SECTION-I**

### **Unit:1 (05)**

Elements of seismology – terminology, structure of earth, causes of an earthquake, plate tectonic theory, continental drift theory, elastic rebound theory, seismic waves, magnitude and intensity, methods of measurement, energy released, seismograph, strong motion earthquakes, accelogram, prominent earthquakes of India

### **Unit:2 (07)**

Fundamentals of theory of vibration, free and forced vibrations (harmonic loading) of single degree of freedom systems. Undamped and viscously damped vibrations, equations of motion and solution, General dynamic loading Duhamel Integral, earthquake response of SDOF system

### **Unit:3(06)**

Response spectrum theory: Earthquake response spectrum, tripartite spectrum, construction of design response spectrum, effect of foundation soil

and structural damping on design spectrum, evaluation of lateral loads due to earthquake on multistory buildings as per IS 1893–2016 Part I

## **SECTION- II**

### **Unit : 4**

#### **Part A: (04)**

Conceptual Design: Planning aspects, Load path, Stiffness and strength distribution, different structural system, liquefaction and settlement.

#### **Part B: (05)**

Earthquake Resistance Design Principles: Design philosophy, Behavior of RC building, ductility and ductile detailing of beam and columns using IS 13920.

### **Unit:5 (04)**

Masonry Structures: Behavior of unreinforced masonry and reinforced masonry, RC bands, vertical reinforcement, openings, Provisions of I.S. 4326, Repairs and strengthening of masonry and RC members.

### **Unit:6 (05)**

Introduction to Earthquake resistant modern techniques – Base Isolation- Elastomeric, Sliding, Combined.

Seismic Dampers - Friction Dampers, TMD, Visco elastic dampers.

#### **Term work:**

- 1) One assignment on each unit.
- 2) Calculation of seismic forces by using any FEM software or RESIST Software.

#### **Text Book-**

1. Earthquake Resistance Design of Structure – S. K. Duggal , Oxford Uni. Press
2. Earthquake Engineering- Manish Shrikhande and Pankaj Agarwal, Prentice Hall of India Pvt Ltd, New Delhi
3. Structural Dynamics - Mario Paz CBS Publication
4. Foundation Design Manual – N.V. Nayak, Dhanpatrai and sons, Delhi
5. Earthquake resistant design of structures by Vinod Hosur, Wiley precise textbook series.
6. Earthquake Dynamics of Structures A primer, A K Chopra earthquake engineering research institute
7. Elements of Earthquake Engineering – Jai Krishna, South Asian Pub. New Delhi
8. Earthquake Resistant Design of Masonry and Timber Structures – A.S. Arya
9. Earthquake Resistant Design of R.C.C. Structures – S.K. Gosh

#### **Reference books :**

1. Dynamics of Structures- Theory and Applications to Earthquake Engineering by A.K. Chopra – Prentice Hall Publications.
2. Earthquake Resistant Structures – D.J. Dowrick John Wiley Publication
3. Dynamics of Structures – R. M. Clough and Ponian , McGraw Hill co. New Delhi
4. Mechanical Vibrations – G.R. Grover Roorkee University, Roorkee.



5. Analysis and Design of Foundations for Vibrations – P.J. Moove. Oxford and I. B. H. Publication, Delhi
6. Manual of Earthquake Resistant Non engineering Construction, University of Roorkee
7. Elements Seismology – Rochter
8. IITK-BMTPC Earthquake Tips, National Information Centre of Earthquake Engineering, IIT Kanpur.
9. Government of Maharashtra Earthquake resistant design of house guiding lines and assessment of damages.
10. IS 1893 -2016 – Part-I and IS 13920, IS 4326.

**Guidelines regarding question paper setting:**

1. Section –I – Q.No-1 to Q.No-3 and Section –II – Q.No-4 to Q.No-6
2. All questions are Compulsory
3. Internal option question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks

**END SEMESTER EXAMINATION PAPER PATTERN**

Question No.	Based on Unit No.	Marks
1	1	07
2	2	14
3	3	14
4	4	12
5	5	12
6	6	11

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**QUANTITY SURVEY AND VALUATION**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Total credit	Scheme	Theory (Marks)		Practical (Marks)	
<b>Quantity Survey and Valuation</b> <b>(PCC-CV703)</b>	3	-	2	4		Max	Min for Passing	Max	Min for Passing
					ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE – In Semester Evaluation    CIE – Continuous Internal Evaluation    ESE – End Semester Evaluation

**Course Objectives:**

1. To understand the basic skills in estimation of Civil Works.
2. To prepare specifications & rate analysis of various items.
3. To carry out the estimation for various Civil engineering structures.
4. To understand the valuation of Civil Engineering Structures.

**Course Outcome:** After successful completion of this course students will be able to:

1. Explain the importance of estimation in Civil Engineering works.
2. Prepare rate analysis of various items.
3. To estimate for various construction projects.
4. Explain importance of valuation in Civil Engineering works.

**Section I**

**Unit : 1**

**(06)**

- a) General introduction to quantity surveying – purpose of estimates, Types of estimates - Detailed estimates & approximate estimates, purpose, various methods used for building and other civil engineering works such as bridge. Water supply, drainage, road project, school building, industrial sheds. Various items to be included in estimates.
- b) Principles in selecting units of measurement for items , various units and modes of measurement for different trades, administrative approval & technical sanction of estimates, I.S. 1200, introduction to D.S.R.
- c) Prime cost, provisional sum & provisional quantities.

**Unit :2**

**(06)**

- a) Specifications - Definition and basic principle of general and detailed Specifications (writing the detailed specification for various Constructions should be covered in term work)
- b) Analysis of rates, factors affecting the cost of materials, How to fix up the rate of items Task Works, standard schedule of rate, price escalation.

**Unit : 3****(06)**

- a) Measurement and abstract sheets and recordings, taking out quantity methods – Long wall-short wall method, Centre line method.

**Section II****Unit : 4****(06)**

- a) Detailed estimate of building, R.C.C. Works, culverts, earthwork for canals, Roads including hill roads and other civil engineering works,
- b) Preparation of schedule for steel as reinforcement.

**Unit : 5****(06)**

- a) Valuation- Definition and Principles of valuation, Purposes. Definition of value, price & cost, Attributes of value, Different types of values.
- b) Values and his duties, factors affecting the valuation of properties, Tangible and Intangible properties, Landed properties – freehold and leasehold properties, Different types of lease.
- c) Valuation from yield and from life, Gross income and Net income, Outgoings, Capitalized value, Years purchase – single rate and dual rate, reversion value of land

**Unit : 6****(06)**

- a) Methods of valuation - Rental method of valuation, direct comparison with capital value, valuation based on profit, valuation based on cost, Development method of valuation.
- b) Rent – Definition, form of rent, different types of rent.
- c) Depreciation – methods of depreciation: Straight line method, Constant percentage method, Sinking fund method and Quantity survey method, Obsolescence

**Term Work:**

- 1] Detailed specification for minimum ten civil engineering items. (One each from Roads, Irrigation works, Water Supply & Sanitation & seven from buildings)
- 2] Rate Analysis of ten civil engineering items.(Prepare excel sheet for minimum 5 items of works)
- 3] Detailed estimate of G + 1 residential Framed Structure.
- 4] Preparing detailed estimate for any one of the following:
  - a) A stretch of a road about 1 Km. long including earthwork.
  - b) A reach of canal about 1 Km. long.
  - c) A factory shed of steel frame.
- 5] Schedule of reinforcement for the following
  - a) Beams
  - b) Slab,
  - c) Staircase
  - d) Column & Column footing
- 6] Valuation reports for building of residential purpose or commercial purpose
- 7] Detailed estimation of building having 10 sq.m.area by using any software.

**Text Books:**

1. Quantity Surveying – P. L. Bhasin., S. Chand & Co-Ramnagar, Delhi-110055
2. Elements of Estimating and Costing – S. C. Rangwala. Charotar Publishing House - Opp Amul Dairy Court road Anand.388001 (west rly )India.
3. Civil Engineering, Contracts and Estimates – B. S. Patil. Universities Press Private Ltd. 3-5-819 Hyderguda, Hyderabad. 500029(A.P),India.
4. Estimating and Costing – B.N.Dutta. Dhanpat Rai & Sons. 1682, NaiSarak, Delhi-110006
5. Estimating and Costing – BirdiDhanpat Rai & Sons 1682, NaiSarak, Delhi-110006
6. Estimating, Costing and Specification in civil engineering – Chakroborty M. 21 b, BhabanandaRoad,Kolkata-700026
7. Valuation of real Properties – S. C. RangwalaCharotar Publishing House, opposite Amul dairy, court Road Anand. 388001.India
8. Standard specifications Volumes I & II (P. W. D. Maharashtra) Govt. of Maharashtra

#### **Reference Books:**

1. Professional Practice (Estimating and Valuation) – Roshan Nanavati (1984 Edition) U.B.S. Publishers, Distributers PVT. Ltd.5 Ansari road, New Delhi.
2. Standard specifications Volumes I & II (P. W. D. Maharashtra) Govt. of Maharashtra
3. C.P.W.D. specifications& schedules of rates.

#### **Guidelines regarding question paper setting:**

1. Section –I – Q.No-1 to Q.No-4, Q.No3 Compulsory, Solve any two from Q.No. 1/2/4 and Section –II – Q.No-5 to Q.No-8, Solve any two
2. Time allotted to solve 70 marks Q.Paper 03 Hours

#### **End Semester Examination Paper Pattern**

Question No.	Based on Unit	Marks
1	1	10
2	2	10
3	3 (Compulsory)	15
4	1,2,3	10
5	4	11
6	5	11
7	6	12
8	4,5,6	12

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**TRANSPORTATION ENGINEERING – I**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Total credit	Scheme	Theory (Marks)		Practical (Marks)	
<b>Transportation Engineering – I</b> <b>(PCC-CV704)</b>	3	-	2	4		Max	Min for Passing	Max	Min for Passing
					ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE – In Semester Evaluation    CIE – Continuous Internal Evaluation    ESE – End Semester Evaluation

**Course Objectives:**

1. To Study of the various principles of highway planning, design of flexible and rigid pavements, traffic engineering, traffic safety analysis
2. To familiarizing the students with desirable properties and testing procedures of highway construction materials as per BIS and Indian Roads Congress (IRC) standards.
3. To know about tunneling methods in various types of soils.

**Course Outcomes:** After successful completion of this course students will be able to

1. Carry out surveys involved in planning and highway alignment
2. Design the geometric elements of highways and expressways
3. Carry out traffic studies and implement traffic regulation and control measures and intersection design
4. Characterize pavement materials and design flexible and rigid pavements as per IRC

**SECTION I**

**Unit 1: Introduction to Highway Engineering:(06)**

- 1.1 Modes of transportations, their importance and limitations, the importance of highway transportation. Highway Development and Planning: Principles of Highway planning.
- 1.2 Road development in India, NHAI, NHDP, PMGSY, MSRDC. Classification of roads, road network patterns, Planning Surveys.
- 1.3 Terrain classification, design speed, vehicular characteristics, highway cross-section elements.
- 1.4 Sight distance: introduction to sight distance, reaction time, analysis of safe sight distance, analysis of overtaking sight distance, intersection sight distance.

**Unit 2: Highway Geometric Design: (06)**

- 2.1 Design of horizontal alignment: horizontal curves, design of super elevation and its provision, radius at horizontal curves, widening of pavements at horizontal curves, analysis of transition curves.

2.2 Design of vertical alignment: different types of gradients, grade compensation on curves, analysis of vertical curves, summit curves, valley curves.

2.3 Intersection: at grade and grade separated intersections, speed change lanes, Canalization, Design of rotary intersection and mini roundabout.

### **Unit 3: Pavement Materials & Design: (06)**

3.1 Pavement materials- Stone aggregates: desirable properties, tests, requirements of aggregates for different types of pavements. Bituminous materials: types, tests on bitumen, desirable properties, selection of grade of bitumen. Bituminous mix design: principle, methods, modified binders.

3.2 Design of pavements-Types of pavements, functions of pavement components, pavement design factors, design wheel load, equivalent single wheel load, repetition of loads, equivalent wheel load factors, strength characteristics of pavement materials, climatic variation; design steps of flexible highway pavement as per IRC 37-2001 and problems based on CBR method, Design of rigid pavement as per IRC 58-2002, Stresses in rigid highway pavements,

3.3 Joints in rigid pavements: transverse joints, longitudinal joints, fillers and sealers.

## **SECTION II**

### **Unit 4: Highway Construction, Maintenance & Rehabilitation (06)**

4.1 Highway construction- construction of different Types of roads: water bound macadam, BBM, SDBC, DLC & PQC, use of geo-textiles and geo-grids.

4.2 Highway maintenance & rehabilitation- Pavement failures: flexible pavement failures, rigid pavement failures, maintenance of different types of pavements: assessment and need for maintenance, pavement management system, evaluation of pavements: structural evaluation of pavements, functional evaluation of pavements, strengthening of existing pavements: object of strengthening, types of overlays, design of different types overlays.

### **Unit 5: Traffic Engineering & Highway Drainage (06)**

5.1 Traffic Engineering: Fundamentals of traffic flow, Road User and Vehicular characteristics. Traffic Studies: Volume studies, speed studies, parking studies, origin-destination studies and accident studies.

5.2 Traffic management and Safety: Traffic control devices, channelization, traffic signal, junctions, intelligent transportation system, Design of Rotary Intersection and traffic Signal.

5.3 Highway drainage- Necessity, surface draining and sub drainage

### **Unit 6: Tunnel Engineering (06)**

6.1 Tunnel Engineering: Introduction to tunneling, size and shape of tunnel and suitability

6.2 Tunneling in hard rock, and soft material, shield method, safety measures,

6.3 Ventilation, lighting and drainage of tunneling.

**Term work:** At least two assignments on each unit including design problems

#### **List of experiments**

- Aggregate Impact Value
- Los Angeles Abrasion Test
- Crushing test of aggregate
- Bitumen Penetration
- Softening Point

- Flash Point and Fire Point Test
- Ductility test
- Viscosity of bitumen
- Stripping value

### Text Books

1. Highway Engineering By S.K.Khanna and C.E.G.Justo, NemchandBross. Roorkee.
2. Traffic and transport planning, By L.R.Kadiyali, Khanna publisher, New Delhi.
3. Principles and practice of highway engineering, by L R Kadiyali, N B Lal Khanna Publications, 2005
4. Principles Of Transportation Engineering, ParthaChakroborty, PHI Learning, 1st edition
5. Principles of Highway Engineering and Traffic Analysis, 4th Edition, Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski, John Wiley
6. Harbour, Dock and Tunnel engineering by R. Shrinivassan, Charotar Publishing House.

### Reference Books

1. Transportation Engineering – An Introduction, by Khistry, C.J, PHI Publication.
2. An Introduction to Transportation Engineering and Planning, by Morlok, E.R., McGraw Hill, NY, 1970
3. Introduction to transportation Engineering, by Hay W.W., John Wiley & Sons, NY, 1988.
4. Fundamentals of transportation Engineering, by Papacostas C.S., Prentice Hall of India, 1987.
5. IRC-37-2001 - Guidelines for the Design of Flexible Pavements for Highways
6. IRC-058-1988 - Guidelines for the Design of Plain Jointed Rigid Pavements for Highways
7. IS 1201 to 1220 Methods for testing tar and bituminous materials.
8. IS 1201 to 1220 Methods for testing tar and bituminous materials
9. IS 2386 : Part1 to 5 : 1963 Methods of Test for Aggregates

### Guidelines Regarding Question Paper Setting:

1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No.5, 6, 7.

### End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15
5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

### **Elective I**

Sr.No.	Name of Subjects
1.	Advanced Traffic Engineering
2.	Open Channel Hydraulics
3.	Remote Sensing and GIS Application in Civil Engineering
4.	Solid Waste Management
5.	Optimization Techniques
6.	Town Planning



**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**Professional Elective I: Advanced Traffic Engineering (PCE-CV705)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL - I (PCE-CV705)	03	01	--	04	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE: In Semester Evaluation    CIE: Continuous Internal Evaluation    ESE: End Semester Examination

**Course Objectives:**

1. Provide an insight on traffic and its components, factors affecting road traffic.
2. Provide an insight on traffic movements and speed studies.
3. Provides clear understanding on conducting various types of traffic surveys, data collection, analysis, inference and presentation.
4. To identify the role of various modes of Mass Transportation like Bus and Rail and its Planning and Management.
5. Learn the objectives, benefits in ITS and functional areas in ITS.

**Course Outcomes:** After the Successful completion of the course students should be able to

1. Acquire and apply knowledge of traffic, its components, factors affecting road traffic.
2. Analyse traffic speed study data and its presentation.
3. Apply the knowledge of sampling data in conducting various surveys and analysis.
4. Understand various modes of mass transit system.
5. Use the advantages of ITS and suggest the appropriate technologies for field conditions

## **SECTION- I**

**Unit: 1**

**(05)**

**Introduction:** Infrastructure & its role in developing society; Transport sector in India – policy framework; Development plans – Airports, Highways – National highway development program (NHDP); JNNURM, Asian highways network (AH).

**Unit: 2**

**(06)**

**Traffic characteristics:** Traffic characteristics – Road user characteristics, General human characteristics, Physical characteristics. Vision eye – movement peripheral vision, Visual attention, Visual sensitivity to light and colour, glare vision and recovery perception of space. Hearing, Stability sensation, Time factor in response, Theory of PIEV modifying factors, conditional responses; Vehicular Characteristics – types, dimensions, resistance, power requirement for different resistance, change in direction – minimum turning radius, off tracking, slip angle.

**Unit: 3****(07)**

**a) Traffic Engineering & Speed Analysis:** Introduction, Speed studies, journey time and delay studies, Sampling in traffic studies & application, Traffic surveys-types of volume count Planning, Problems on PCU, moving observer method and spot speed.

**b) Traffic operation and management.**

Traffic systems management and Travel demand management - Congestion management-Cost effective management measures, Traffic control aids, Street furniture, Road Arboriculture– Traffic Regulation, Traffic Sign and Road Markings.

## SECTION II

**Unit: 4****(05)**

**Trip generation and distribution:** Factors governing trip generation and attraction –Application of Regression Analysis- Methods of trip distribution; Growth and Synthetic Models Calibration and Application of gravity model.- Category analysis.

**Unit: 5****(07)**

**a) Introduction to intelligent transportation systems (ITS)** – Definition, Objectives, Historical Background, Benefits of ITS -ITS Data collection techniques –Detectors, Automatic vehicle location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), Video data collection.

**b) ITS functional areas** – Advanced traffic management systems (ATMS), Advanced traveller information Systems (ATIS), Commercial vehicle operations (CVO), Advanced vehicle control systems (AVCS), Advanced Public transportation systems (APTS), Advanced rural transportation systems (ARTS).

**Unit: 6****(06)**

**Specialized traffic studies:**

**Parking Studies:** Parking inventory, statistics, parking surveys; in out, license plate, on-street and off-street parking.

**Accident Studies:** Accident data collection, statistics, safety audit, safety measures.

**Fuel consumption and emission studies:** Consumption models, pollutants, air quality models, mitigation measures.

**Toll operation:** Design and configuration, queuing theory, operation and maintenance issues.

**Term Work:**

Assignment on each unit

**On field practices.**

- 1) Volume study
- 2) Spot speed study
- 3) Parking study
- 4) Marking study

**Text books:**

1. Kadiyali L.R. and N.B. Lal (2004): Principles and Practice of Highway Engineering Including Expressways and Airport Engineering), Khanna Publishers, New Delhi.
2. Kadiyali L.R. (1994): Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi.

3. ParthaChakroborty and Animesh Das (2003): Principles of Transportation Engineering, Prentice-Hall India, New Delhi.

**Reference books :**

1. Black John (1981): Urban Transportation Planning. Croom Helm Ltd. London.
2. BPR (1970): Urban Transportation Planning: General Information and Introduction to System 360. Bureau of Public Roads, Washington D.C.
3. Bruton M.J. (1975): Introduction to Transportation Planning. II Edn. Hutchinson, London
4. Drew D.R. (1968): Traffic Flow Theory and Control, McGraw-Hill, New York.
5. Hutchinson B.G. (1974): Principles of Urban Transport Systems Planning. McGraw-Hill Book Co., New York.
6. McShane W.R. and Roess R.P. (1990): Traffic Engineering, Prentice-Hall Inc., New Jersey
7. Pignataro L.J. (1973): Traffic Engineering: Theory and Practice, PrenticeHall Inc., New Jersey.
8. Putman S.H. (1983): Integrated Urban Models. Pion Ltd., London.
9. Wilson A.G. (1970): Entropy in Urban and Regional Modelling. Pion Ltd., London
10. Wells G.R. (1970): Traffic Engineering – An Introduction, Griffins, London.
11. Wohl M. and Martin B.V. (1974): Traffic System Analysis of Engineers and Planners, McGraw-Hill Book Co., New York.
12. Papacostas, C.A., Fundamentals of Transportation Engineering', Prentice-Hall of India Private Limited, New Delhi.2000.
13. Road Development Plan, Indian Road Congress, November 2000.
14. Roess, R.P., McShane, W.R. and Prassas, E.S. (1998), Traffic Engineering, Prentice Hall
15. [www.nhai.org](http://www.nhai.org)

**Guidelines Regarding Question Paper Setting:**

1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No.5, 6, 7.

**End Semester Examination Paper Pattern**

Question No.	Based on Unit No.	Marks
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15
5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**PROFESSIONAL ELECTIVE I : OPEN CHANNEL HYDRAULICS (PCE-CV705)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL - I (PCE-CV705)	03	01	--	04	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE: In Semester Evaluation    CIE: Continuous Internal Evaluation    ESE: End Semester Examination

**Course Objectives :**

1. To Study the fundamental principles governing open channel hydraulics required to the design of engineering systems
2. To Study various types of open channel flow and their analysis
3. To study and understand the techniques, skills, and modern mathematical tools to applied to the river engineering problems.

**Course Outcomes :** After the Successful completion of the course students should be able to

1. Apply knowledge of open channel flow for designing most efficient channel section and computations of flow parameters
2. Analyse the Gradually varied, Rapidly varied and Spatially varied flow and apply to complex field problems
3. Design erodible channels by applying the knowledge of sediment transportation
4. Collect, analyse the data and apply similitude to river models

## **SECTION- I**

### **Unit : 1**

**(06)**

**Basic Fluid Flow Concepts:** Basic equations (Continuity, Energy, Momentum) applied to OCF, Energy and Momentum correction factors, First and Second hydraulic exponent, Uniform flow computations by using section factor curve, Determination of Rugosity coefficient 'n', Flow in channel transitions, Measurement of velocity of channel flow and sediment concentration in the flow by various methods. River Gauging by different methods.

### **Unit : 2**

**(06)**

**Non-Uniform Flow in Open Channel:** Computation of GVF in prismatic channels and Natural channels by different methods, Hydraulic jump in rectangular and nonrectangular channels, Location of Jump, Jump on sloping floor, Use of jump as Energy Dissipater (recommended by USBR and IS), Spatially-Variied Flow, Side weir, Bottom racks

**Unit : 3****(06)**

**Flow in Non-linear alignment and Nonprismatic Channels:** Nature of Flow, Spiral Flow, Energy Loss, Superelevation, Cross Waves, Design Considerations for Subcritical and Supercritical flow, Standing wave flume, Venturi flume, Flow between bridge piers, Flow through culvert, Flow through Trash Racks.

**SECTION- II****Unit : 4****(06)**

**Unsteady Flow in Open Channels:** Gradually Varied Unsteady Flow, Flood routing, Rapidly Varied Flow, Waves and their classification, Celerity of a wave, Positive and negative Surges, S Dam-break problem, Introduction to HEC RAS software

**Unit : 5** **(06)**

**a) Dispersion in Open Channels:** Diffusion and dispersion, Some classical solutions of the diffusion equation, Discharge measurement using tracer techniques

**b) Hydraulics of Mobile Bed Channels:** Initiation of motion of sediment, Bed forms, Sediment Load, design of Erodible Channels, Regime Theory for Alluvial Channels

**Unit : 6****(06)**

**Hydraulic Models:** Fixed bed river models (Distorted and Undistorted), Moveable bed Models, Model materials and construction, Physical model calibration and verification, Special-Purpose models

**Tutorial Exercises :****Term work based on**

1. Numerical and design problems on each unit.
2. Visit to the river gauging station.
3. Data collection of river flow and Sedimentation .
4. Use of water resources software.

**Reference books :**

Open Channel Hydraulics: By, Ven Te Chow, McGraw-Hill International Editions

- 1 Open Channel Hydraulics: By, Richard H. French, McGraw-Hill International Student Edition
- 2 Flow Through Open Channels: By, K. G. RangaRaju, Tata McGraw Hill Publsh. Co. Ltd.
- 3 Flow in Open Channels: By, K. Subramanyam, Tata McGraw Hill Publsh. Co. Ltd.
- 4 Open-Channel Flow: By, M. Hanif Chaudhary, Prentice-Hall International Publications
- 5 Mays, L. W., Water Resources Engineering, John Wiley and Sons, New York, 2001.
- 6 Rajesh Srivastava., Flow Through Open Channels, Oxford University Press, 2008.
- 7 Open Channel Flow by Madan Mohan Das.

**Guidelines Regarding Question Paper Setting:**

1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No.5, 6, 7.

**End Semester Examination Paper Pattern**

Question No.	Based on Unit No.	Marks
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15
5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**PROFESSIONAL ELECTIVE I :REMOTE SENSING AND GIS APPLICATIONS IN CIVIL**  
**ENGINEERING (PCE-CV705)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL- I (PCE-CV705)	03	01	-	04	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE: InSemesterEvaluation CIE: ContinuousInternalEvaluationESE: End Semester Examination

**Course Objectives:**

1. To study the evolution of Remote Sensing and G.I.S
2. To get a basic and advanced level insight into the approach of latest remote sensing techniques.
3. To understand the application of Geographical information system in civil engineering

**Course Outcomes:**After completing of this course, student will be able to,

1. Adopt the principles of physics of Electromagnetic radiation as applied to remote sensing.
2. Learns the interrelationship of civil, environmental and geological studies.
3. Formulate and apply remote sensing and GIS concepts to engineering problems.

## **Section I**

### **Unit No.1 Introduction**

(06)

1.1 Definition, History, Types of satellites based upon uses,  
 1.2 Programs of different countries, India's position, etc. Scope - Various fields of applications, Users in India, Data requirements of users. Topo sheets, Evolution of G.I.S. Technology.

### **Unit No.2 Space System**

(08)

2.1 Technique of aerial photography, Photographic flight mission, Factors influencing flight mission, Numbering, scale and measurement of aerial photographs, mosaic of aerial photographs, introduction of mirror stereoscope

- 2.2 Remote Sensing Technique of satellite imaging - Important units of satellite and functioning of satellite, height, and coverage.
- 2.3 Stages in remote sensing, Electromagnetic radiation, and electromagnetic spectrum, Interaction of electromagnetic radiation with atmosphere and earth surface.
- 2.4 Sensors, Types of Resolutions used in remote sensing.
- 2.5 Introduction to the application of computer in analysis of satellite images, Digital Image processing.

### **Unit No.3 Geomorphology**

**(04)**

- 3.1 Geomorphology and its scope in photo interpretation as well as in engineering,
- 3.2 Drainage analysis, Drainage patterns, Drainage density and Drainage frequency.
- 3.3 Geomorphologic aspects for water resources studies.

## **Section II**

### **Unit No. 4 G.I.S.**

**(07)**

- 4.1 Fundamentals of GIS, Definition, Components, Types of data inputs in GIS, spatial data, thematic characteristics, rasters and vectors,
- 4.2 Databases and database management.

### **Unit No.5 Application of RS and G.I.S in Civil Engineering**

**(05)**

- 5.1 Study and selection of site or hydraulic structures, Application in urban planning.
- 5.2 Use in Landslide, Application in Urban Planning and transportation engineering.

### **Unit No.6 Application of RS and G.I.S in water Resources and Environmental Studies:(06)**

- 6.1 Surface water delineation, study of floods, surface keys for subsurface water, steps in water investigations of the area.
- 6.2 Land use/Land cover study, Terrain analysis and soil mapping with the help of remote sensing techniques, delineating forest areas.

**Term Work:**The term work shall consist of the Assignment on each unit and laboratory work based upon following syllabus-

#### **Laboratory Work:**

1. Study of topo sheets.
2. Study of drone survey
3. Study of drainage density, drainage pattern, watershed from Soil and water Maps.
4. Ground truth data collection using Total station and G.P.S.
5. G.I.S- Open Source Quantum GIS for practical's.
  - a. Georeferencing of toposheets.
  - b. Vectorisation (digitization) of raster Images.
  - c. Converting Google map kml files into shape files.

The oral examination based upon above syllabus of the term work.

#### **Reference Books:**



- 1) American Society of Photogrammetry Washington D. C. Manual of Photographic Interpretation. (1960) and (1975)
- 2) Remote Sensing, Principles and Interpretation –F. F. Sabins, W. H. Freeman &co.
- 3) Principles of Geomorphology – W. D. Thornbury – John Wiley and Sons, INC.
- 4) G.I.S- Anji Reddy , publishers- MGH
- 5) Remote sensing in Civil Engineering – T. J. M. Kennie and M. C. Mathews, Surry University press, London.
- 6) Remote Sensing and Image Interpretation- Thomas M. Lillesand and R.W. Kiefer, Wiley & Sons Insc.
- 7) Remote Sensing of the Environment – John R. Jensen, Pearson Education Inc
- 8) Principles of Remote Sensing- P.N.Patel and Surendra Singh, Scientific Publishers, Jodhapur.
- 9) Text book on Remote Sensing –C.S.Agrawal and P.K.Garg,Wheeler Publishing, New-Delhi.
- 10) Introduction to geomatics –QGIS user guide – Mr.C.V. Nishinkanth, Mrs.AnnuNishinkanth, Dr S S Vasudevan, Dr P Ramkumar, Publishers-

#### **Guidelines Regarding Question Paper Setting:**

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional questions should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

#### **End Semester Examination Paper Pattern**

<b>Question No.</b>	<b>Based on Unit No.</b>	<b>Marks</b>
1	1	12
2	2	12
3	3	11
4	4	11
5	5	12
6	6	12

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**PROFESSIONAL ELECTIVE I : SOLID WASTE MANAGEMENT (PCE-CV705)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL - I (PCE-CV705)	03	01	--	04	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE: InSemesterEvaluation

CIE: ContinuousInternalEvaluation

ESE: End SemesterExamination

**Course Objectives:**

1. To get on broader understandings on various aspects of solid waste management (starting from its generation to processing with options for reuse and recycle, transport, and disposal)
2. To study different processing technologies of municipal solid waste.
3. To know the various aspects including recovery of biological conversion products from solid waste to compost and biogas, incineration and energy recovery
4. To know various disposal methods of solid waste.

**Course Outcomes:**After successful completion of this course students will be able to,

1. Learn basic concepts of solid waste management, beginning from source generation to waste disposal in a system of municipality organizational structure.
2. To acquire a fair amount of knowledge on waste characterization and its management practices
3. Develop understanding on various technological applications for processing of waste and their disposals in various ways.
4. Acquire knowledge on waste to energy productions in the perspectives of sustainable development.
5. Apply basic concepts in hazardous waste management and integrated waste management for urban areas.

## **SECTION I**

**Unit 1: Introduction to Solid Waste Management:**

**(06)**

- 1.1 Introduction , Overview: problems and issues of solid waste management - Need for solid waste management
- 1.2 Indian scenario, progress in MSW (municipal solid waste) management in India , Rules & regulation regarding MSWM ,
- 1.3 Functional elements of Solid Waste Management.
- 1.4 Classification of solid wastes (source and type based)
- 1.5 Hazardous waste:-Definition, sources, hazardous characteristics, management, treatment and disposal
- 1.6 Biomedical waste:-Definition, sources, classification, collection, segregation- Color coding, treatment and disposal

## **Unit 2: Solid Waste Generation, Handling, Storage and Processing**

**(06)**

- 2.1 Waste generation, Solid waste generation rates and expression of unit generation, Methods used to estimate Waste Quantities, factors affecting generation of solid wastes.
- 2.2 Composition, sampling and characteristics of waste (physical and chemical),
- 2.3 Solid Waste Handling, Storage and Processing at the Source - Introduction, On-site handling, storage and segregation of wastes at source, On-site processing.
- 2.4 Collection of municipal solid waste - Methods of collection, Types of Collection system, Analysis of Collection System, Collection routes.

## **Unit 3: Transfer and Transport of Solid Waste and Waste Processing:**

**(06)**

- 3.1 Transfer station- Introduction, Need, Types, Criteria for Transfer station location, Factors to be considered in planning and design of Transfer Station.
- 3.2 Transport - Common Waste Collection Vehicles, factors considered in selecting collection vehicles
- 3.3 Waste Processing – Objectives, Unit operations for component separation, material separation and processing technologies.
- 3.4 Material Recovery Facilities (MRF) & types, Commonly Recycled Materials and Processes.

## **SECTION II**

### **Unit 4: Land Disposal of Solid Waste**

**(06)**

- 4.1 Sanitary landfilling - Introduction, Impacts from Dumps , Essential components of sanitary landfilling,
- 4.2 Methods of landfilling, site selection criteria for landfilling ,
- 4.3 Planning & designing of sanitary landfilling , Sanitary Landfilling Construction
- 4.4 Leachate :- Drainage, Collection and Removal , Leachate Management & treatment, Landfill gas and its control measures
- 4.5 Maintenance and precautions of landfilling, Closure & end-use.

### **Unit 5: Biological Treatment of Solid waste – Composting**

**(06)**

- 5.1 Composting- Definition and phases of composting , Theory of composting
- 5.2 Types of composting, Methods of composting
- 5.3 Factors affecting composting process, Compost quality
- 5.4 Vermi Composting, Mechanical composting plant, Recovery of Bio – gas energy.

### **Unit 6: Incineration**

**(06)**

- 6.1 Introduction, Objectives of Incineration, Need of incineration
- 6.2 Incineration process, Types of incinerators,
- 6.3 Site selection criteria, factors affecting incineration,
- 6.4 Waste to energy, Pyrolysis and its by-products
- 6.5 Air pollution and its control.

### **Term work:**

- A. At least one assignment on each unit.
- B. Visit to any Municipal Solid Waste Processing Plant/Unit & its report.

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### **Text Books**

1. Integrated Solid Waste Management: Engineering principles and management issues by George Tchobanoglous, Hilary Theisen, Samuel A Vigil, , M/c Graw hill Education . Indian edition.
2. Environmental Engineering by Howard S Peavy, Donald R Rowe and George Tchobanoglous , Tata Mcgraw Hill Publishing Co ltd.,

#### Reference Books:

1. Municipal Solid Wastes (Management and Handling) Rules, 2000.Ministry of Environment and Forests Notification, New Delhi, the 25th September, 2000. Amendment – 1357(E) – 08-04-2016
- 2.Municipal Solid waste management manual, Part II published under Swachh Bharat Mission, Central Public Health And Environmental Engineering Organization (CPHEEO), 2016, Ministry of Urban Development, Government of India.
- 3.Handbook of Solid waste management, second edition, George Tchobanoglous, Frank Kreith, published by M/c Graw hill Education, 2002, ISBN-13 9780071356237 ISBN -10 0071356231

#### Guidelines Regarding Question Paper Setting:

- 1.Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
- 2.Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No.5, 6, 7.

#### End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15
5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**PROFESSIONAL ELECTIVE I :OPTIMIZATION TECHNIQUES (PCE-CV705)**

Course	TeachingScheme				EvaluationScheme				
	L	T	P	Credit	Scheme	Theory(Marks)		Practical(Marks)	
						Max.	Min. forpassing	Max.	Min. forpassing
EL-I (PCE-CV705)	03	01	00	04	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE:InSemesterEvaluation

CIE:ContinuousInternalEvaluation

ESE:EndSemesterExamination

**Course Objective:**

1. To provide the students with knowledge on the application of various optimization techniques which can help making decisions for practical problems in industries.
2. Building capabilities in the students for analyzing different situations in the industrial/Business scenario involving limited resources and finding the optimal solution within constraints by using advanced optimization tools.

**Course Outcomes:**After successful completion of this course students will be able to,

1. Apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems.
2. Ability to go in research by applying optimization techniques in problems of Engineering and Technology.
3. The students will be able to analyze the real life systems with limited constraints.
4. The students will be able to depict the systems in a mathematical model form.

**SECTION-I**

**Unit : 1**

**(06)**

Introduction: Importance of optimization techniques , Linear programming:  
Formulation, graphical solution, simplex method, Big M Method.

**Unit : 2**

**(06)**

Duality, Sensitivity analysis, Transportation problems.

**Unit : 3**

**(06)**

Assignment problems,Introduction to non linear programming.

28

**SECTION-II**

**Unit : 4** (06)

Decision theory, decision tree, Game theory.

**Unit : 5** (06)

Inventory models -deterministic model ,probabilistic model.

**Unit : 6** (06)

Queuing theory, simulation applications, Forecasting techniques.

**Term Work:**

At least one assignment based on each unit.

**Reference books :**

1 Optimization –S. S. Rao, Wiley Eastern Ltd.

2 Operation Research -H. A. Taha, MacMillan

3 Graph Theory –Narsingh Rao, Prentice Hall

4 Operation Research –Wagner, Wiley Eastern Ltd.

5 Project Management –Lick D., Gower Publication England

**Guidelines Regarding Question Paper Setting:**

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6

2. All questions are compulsory.

3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

**End Semester Examination Paper Pattern**

Question No.	Based on Unit No.	Marks
1	1	12
2	2	12
3	3	11
4	4	11
5	5	12
6	6	12

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**PROFESSIONAL ELECTIVE I: TOWN PLANNING(PCE-CV705)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL - I (PCE-CV705)	03	01	--	04	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE: InSemesterEvaluation CIE: ContinuousInternalEvaluation ESE: End SemesterExamination

**Course Objectives-**

1. To understand the concept of balanced town by ensuring that new and existing facilities are complimentary to each other.
2. Provides a basic knowledge on Urbanizations and its trend.
3. Deals with different types of plan, its implementation, regional development and management for sustainable urban growth.
4. Describe different legislations related to urban planning and policy.

**Course Outcomes-**After successful completion of this course students will be able to,

1. Understand importance of town planning and its past trends.
2. Understand with a different types of urban strategies and management for sustainable urban growth.
3. Understand the different types of acts related to town and country planning

## **SECTION- I**

**Unit: 1**

**(04)**

Introduction: Objects of town planning, principles of town planning, Origin and growth of towns – development of towns, Modern town planning in India, Socio – Economic aspects of town planning. Selection of site for an ideal town.

**Unit: 2**

**(06)**

A) Surveys & Planning: Various types of surveys to be conducted for town planning project. Data's to be collected in different types of town planning survey. Types of planning, -a brief note on urban, rural and regional planning

b) Zoning: Definition – objects and principles of zoning. Advantages of zoning, Special Economic Zone (SEZ), Maps for zoning.

**Unit: 3**

**(08)**

30

A) Housing: Classification of residential building as per HUDCO norms, Housing in villages, Low Cost Housing, Housing policy, different types of housing agencies involved in housing, investment in Housing, Housing Problems in India

B) Slums: Causes, growth, characteristics, effects, slum clearance and re-housing, prevention of slum formation, financial assistance for slum clearance.

## **SECTION- II**

### **Unit 4:**

**(05)**

Public buildings & Industries: Classification, location, Design Principles of public building, Effects of Industries on towns and cities, classification of industries, regulation of their location.

Recreation measures: Parks- park ways, Playgrounds, Theme parks, boulevards and their space standards.

### **Unit 5:**

**(07)**

A) Master Plan: Meaning – Definition – objects and necessity of master plan, Data and Drawings required for master planning. Building byelaws, Preparation of a layout plan for a residential area showing LIG, MIG and HIG houses and other amenities (not to scale).

B) Re-planning Existing Towns: General - Objects of re-planning – Analyzing the defects of existing towns – difficulties in Master Planning of existing towns / cities - Urban renewal projects, merging of suburban areas – Decentralization - Satellite Towns – Smart cities- definition and features.

### **Unit 6:**

**(06)**

A) Town and Country Planning Act, Improvement Trust Act, Urban Planning and Development Authorities Act – objectives, contents, procedures for preparation and implementation of Regional Plans, Master Plans and Town Planning Schemes. Various Acts related to urban governance.

B) MRT Act, Provisions of Land Acquisition Act, Urban Land Ceiling Act, Conservation Act.

### **Text Books:**

1. Town and country Planning-G.K. Hiraskar & K. G. Hiraskar, By Dhanpat Rai Publication (p) Ltd., 22 Ansari Road, Dariyaganj New Delhi.
2. Town and country Planning- N.K. Gandhi
3. Town Planning- S.C. Rangawala, Charotar Publications, Pune
4. Town Planning by Abir Bandyopadhyay.

### **Reference books:**

1. MRT Act 1966
2. Land Acquisition Act - 1894
3. Urban Pattern by Gallion, Eisner
4. Rural development Planning – Design and method : Misra S.N., Satvahan Publications New Delhi
5. Economic development in Third world: Todaro Michael, Orient Longman Publication, New-Delhi



**Guidelines Regarding Question Paper Setting:**

1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No.5, 6, 7.

**End Semester Examination Paper Pattern**

Question No.	Based on Unit No.	Marks
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15
5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**Legal Aspects in Civil Engineering**

Course	Teaching Scheme				Scheme	Evaluation Scheme			
	L	T	P	Credit		Theory (Marks)		Practical (Marks)	
						Max.	Min. for Passing	Max.	Min. for Passing
LACE (HM-CV706)	02	--	02	03	ISE	---	---	25	10
					CIE	---	---	---	---
					ESE	---	---	---	---

ISE: In Semester Evaluation   CIE: Continuous Internal Evaluation   ESE: End Semester Examination

**Course Objectives:**

1. To aware the students about Indian Contract and Arbitration act.
2. To provide knowledge about contract administration.
3. To provide knowledge about safety acts.

**Course Outcome:**After successful completion of this course students will be able to:

1. Students will learn Indian contract act, Arbitration act and contract administration.
2. Students will understand the labour laws.
3. Students will be understand safety engineering and relevant acts.

**Unit I Contract and Tenders:**

**(06)**

Contracts, Types of Contracts, Tender document- invitation of tenders. Tender notice, tender documents, Submission. Scrutiny and acceptance two envelop method. Award of jobs. Various conditions to contracts. Rights and responsibilities of parties of contracts. E- Tendering, Introduction to Non-Conventional Contracts

**Unit II Contract administration:**

**(06)**

Essentials of legally void and avoidable contracts, contract for engineer and architecture services, contract between owner and contractor. Introduction to RERA

**Unit III Arbitration:**

**(06)**

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Introduction to Indian Arbitration Act, Arbitration Agreement, Power and Duties of Arbitration, Different types of arbitration, Qualification of arbitrator.

**Unit IV Safety laws and acts:****(06)**

Workmen's Compensation Act, Safety and health standards, Employer's liability act, Employer's Insurance act.

**Term Work:**

1. One assignment per unit.
2. Visit to one Public Bodies & prepare a report regarding tendering process over there.
3. In house tendering process which includes demonstration & preparation of reports in batches

**Text Books:**

1. Indian arbitration Act by B. S. Patil
2. Contract-I by R. K. Bangia
3. Contract-II by R. K. Bangia
4. Estimation, Costing, Specification, and valuation in Civil Engineering by M. Chakraborti.
5. Estimation & Costing in Civil Engineering by B.N.Dutta, UBS Publishers & Distributors Pvt. Ltd.
6. Civil Engineering Contracts & Estimates by B. S. Patil
7. Legal Aspects of building and Engineering Contracts by B. S. Patil
8. Indian contract Act Avatar Singh
9. Indian Contract Act.

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**FIELD TRAINING**

Course	Teaching Scheme					Evaluation Scheme			
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for Passing	Max.	Min. for Passing
FT (SI-CV707)	--	--	--	--	ISE	---	---	25	10
					CIE	---	---	---	---
					ESE	---	---	---	---

ISE: In Semester Evaluation   CIE: Continuous Internal Evaluation   ESE: End Semester Examination

Based on the field training done by the students in T.Y.B.Tech during the winter and summer vacation, as mentioned in the T. Y. B. Tech. syllabus. The oral is to be conducted preferably in presence of expert from field and final term work marks are to be given based on performance in oral exam and the project report in the field book.

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VII**  
**PROJECT PHASE - I**

Course	Teaching Scheme					Evaluation Scheme			
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for Passing	Max.	Min. for Passing
PP-I (PW-CV708)	--	--	02	01	ISE	---	---	50	20
					CIE	---	---	---	---
					ESE	---	---	---	---

ISE: In Semester Evaluation   CIE: Continuous Internal Evaluation   ESE: End Semester Examination

The project work will be a design project, experimental project, field surveying or computer oriented on any of the topics of civil engineering interest. It will allot as a group project consisting of a minimum THREE and maximum FIVE number of students, depending upon the depth of project depth work. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem.

**Probable Activities of Project Phase – I**

01. Submission of project topic with names of group member
02. Finalization of topic and allotment of guide by department through Departmental Research Committee (DRC)
03. Introduction and literature review presentation
04. Methodology and future work presentation
05. Submission of synopsis duly signed by students and guide
06. Presentation of synopsis in front of DRC

The term work assessment of the project will be done continuously throughout the semester by a DRC consisting of 3-4 faculty members from the department along with Project Guide. The students will present their project work before the committee. The complete project report is not expected at the end this semester. However, ten pages typed report based on the work done will have to be submitted by the students to the DRC. The project guides will award the marks to the individual students depending on the group average awarded by the committee.

One Project Guide shall be allotted Maximum TWO groups for guidance.

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For work load calculation minimum load is 1 Hr./week, for one group of FOUR to FIVE students. (As per AICTE Guide Lines).

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VIII**  
**DESIGN OF CONCRETE STRUCTURES-II**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Total credit	Scheme	Theory (Marks)		Practical (Marks)	
DCS-II (PCC-CV801)	4	-	2	5		Max	Min for Passing	Max	Min for Passing
					ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE – In Semester Evaluation

CIE – Continuous Internal Evaluation

ESE – End Semester Evaluation

**Course Objectives:**

1. To study the concept of torsion,
2. To design two span and three continuous beams,
3. To analyse and design water tanks resting on ground by WSM
4. To study concept of prestressed concrete, losses in prestress, analysis & design of prestressed concrete sections.

**Course Outcomes:**

After successful completion of course student will be able to design -

1. Sections subjected to torsion
2. Continuous beams
3. Water tanks resting on ground
4. Prestressed concrete sections

**SECTION- I**

**Unit: 1**

**(07)**

Limit State of Collapse in Torsion - Behavior of R.C. rectangular sections subjected to torsion, Design of sections subjected to combined bending and torsion, combined shear and torsion.

**Unit: 2**

**(08)<sup>37</sup>**

Limit State Design of two span continuous beams and three span continuous beams using IS

coefficient or Moment Distribution Method, Introduction to moment redistribution.

**Unit: 3**

**(09)**

Design of water tank - Introduction to working stress method for water tank design, Calculation of design constants, Design criteria, permissible stresses, design of water tank resting on ground using IS code method – circular water tanks with flexible and rigid joint between wall and floor.

**SECTION- II**

**Unit: 4**

**(08)**

Basic Concept of Prestressing, Types and Systems of Prestressing. Analysis of rectangular and symmetrical I sections. Different cable profiles.

**Unit: 5**

**(06)**

Losses in Prestress - elastic deformation, creep, shrinkage, friction, anchorage slip, relaxation in steel for Pre & Post tensioned members.

**Unit: 6**

**(10)**

Design of Prestress Concrete - Rectangular and Symmetrical I sections by Working Stress Method for flexure.

**Term Work:**

At least one assignment on each unit.

Use of IS: 456-2000, IS:1343, IS 3370 is allowed for students

**Text books :**

1. Limit State Theory & design - Karve & Shah Structures Pub. Pune
2. Reinforced Concrete Design (Limit State) - A.K. Jain
3. Fundamentals of Reinforced Concrete - Sinha & Roy
4. Limit State Design of Reinforced Concrete - P.C. Varghese, Prentice Hall of India, New Delhi
5. Reinforced Cement Concrete - B.C. Punmia
- 8 Handbook of Reinforced Concrete SP-34
- 10 Prestressed Concrete - Sinha & Roy S. Chand & Co. New Delhi

**Reference Books:-**

1. Prestressed Concrete - T.Y. Lin John Wiley & sons New York
2. Prestressed Concrete - N Krishna Raju, Tata McGraw-Hill Publication Company Ltd., New Delhi

**Guidelines regarding question paper setting:**

1. Section – I – Q.No-1 to Q.No-3 and Section – II – Q.No-4 to Q.No-6
2. All questions are Compulsory
3. Internal option question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks

**END SEMESTER EXAMINATION PAPER PATTERN**

Question No.	Based on Unit No.	Marks
1	1	12

2	2	12
3	3	11
4	4	12
5	5	12
6	6	11



**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VIII**  
**WATER RESOURCES ENGINEERING - II**

Course	Teaching Scheme				Scheme	Evaluation Scheme			
	L	T	P	Credit		Theory (Marks)		Practical (Marks)	
						Max.	Min. for Passing	Max.	Min. for Passing
WRE-II PCC-CV802	03	--	02	04	ISE	---	---	25	10
					CIE	30	12	---	---
					ESE	70	28	---	---

ISE: In Semester Evaluation   CIE: Continuous Internal Evaluation   ESE: End Semester Examination

**Course Objectives:**

1. To equip the students with capabilities required for identifying, formulating and management of water resources related issues and problems.
2. To impart the students with knowledge required for planning design, and development of different types of dams and reservoirs.
3. To impart the students with knowledge required for planning design, and development of canal distribution systems for agriculture purpose
4. To make the students understand the importance of hydropower projects and their needs of development.
5. To understand the basic concepts and importance of river engineering works.

**Course outcomes:** After successful completion of this course students will be able to:

1. Identify and understand various issues related to water resources systems.
2. Understand the role of dams and reservoirs in controlling the floods.
3. Plan and design different types of hydraulic structures.
4. Plan, design and monitor an efficient canal network system.
5. Understand the role of rivers in the development of nation.

## **SECTION I**

### **Unit-1**

**(08)**

Introduction to dams and reservoirs: Types of dams, selection of site for dams, selection of type of dam.

Reservoirs – Types of reservoirs, site selection, control levels, Area elevation-curve & Elevation-capacity curve, Reservoir capacity determination using mass curves, Silting of reservoirs, Control of losses in reservoirs.

Earthen dam: Types of earthen dams, Components and their functions, methods of construction of earthen dam, plotting of phreatic line, Modes of failure, seepage control measures - Drainage & filters, stability of slopes for sudden drawdown & steady seepage ~~case~~ only.

### **Unit-2(07)**

**Gravity Dams:** Forces acting on gravity dams, Modes of failures, Stress analysis, Elementary and practical profile, stability analysis, Structural joints, keys and Water seals in Gravity Dams, Drainage galleries, Foundation treatment.

**Arch dams and Buttress dams-** Introduction to different Types.

### **Unit-3 (05)**

**Spillway:** Necessity and function, components of spillway, different types, Energy dissipation arrangements, gates for spillway, Elementary design of an ogee spillway

**Outlets in Dams:** Outlets through concrete and earth dams, different types, Trash racks.

## **SECTION II**

### **Unit-4**

**(05)**

**Diversion Head Works:** Component parts & their functions, types of weir and barrages, Causes of failure and remedies, Introduction to Theories seepage-Bligh's creep theory, critical exit gradient, Khosla's theory.

### **Unit-5 (08)**

**Canals:** Types, alignment, typical sections of canals, balancing depth, Kennedy's and Lacey's silt theories, Canal lining - purpose, types, selection, and economics of lining. Types of canal outlets

**C.D.Works:** Necessity and Types.

**Canal Regulatory Works:** head regulator, cross regulator, canal fall, canal escape, standing wave flume.

**Drainage of Irrigated lands:** Necessity and methods,

### **Unit-6**

**(07)**

**River Engineering:** Classification and types of rivers, meandering phenomenon,

**River training works:** Classification-Marginal bunds, Guide banks and Groynes. River navigation. Interlinking of rivers

**Elements of hydro-power:** Hydro-power & importance, typical layout & functions of components parts-Intakes, conveyance system, surge tanks, Power house, Tail race, Types of hydro-power plants.

### **Term work:**

A) Students have to solve any **Eight** out of following Ten assignments

1. Determination of height of dam: Demand / supply reservoir calculation and control levels and free board
2. Earthen dam: Determination of section (drawing of one plate), one slip circle calculations, Types of failure
3. Gravity dam: Forces acting, Modes of failure, Elementary and practical profile with stability calculations (drawing of one plate),
4. Types of arch dam and buttress dams – Simple sketches and brief explanation
5. Spillway: Geometrical sections, energy dissipation arrangement and gates,

Outlet through earth dam and gravity dam.

6. Typical section of diversion headwork, Different components, Blighs creep theory, khosla's theory.
  7. Typical sections of canals, kennedy&lacey's theory
  8. Types of CD work and canal regulatory works
  9. Different types of river training work, Interlinking of rivers
  10. A typical layout & component parts of Hydropower plant and its functioning
- B) A Report based on field visit to a dam & CD works.

### **Text Books :**

1. "Irrigation Engineering" – S. K. Garg – Khanna Publishers, Delhi.
2. "Water Resources & Irrigation Engineering" – Dr. K. R. Arora, Standard Publisher.
3. "Irrigation, Water Resources and Water Power Engineering" – Dr P.N. Modi, Standard Book House.
4. "Irrigation and Water Power Engineering – Dr. Punmia and Dr. Pande – Laxmi Publications, Delhi
5. "Irrigation Engineering" – Dahigaonkar, Asian Book Pvt Ltd.
6. "Irrigation Engineering" – S. R. Sahastrabudhe, Katson Publishers.
7. "Irrigation Theory and practice" - Michael, Vikas Publications House.
8. "Irrigation Engg.", - G. L. Asawa, Wiley Eastern
9. "Theory and design of irrigation structures" - Varshney and Gupta, vol. I, II and III, New Chand and Brothers.
10. "Irrigation Engineering" - Raghunath, Wiley Eastern Ltd, New Delhi.

### **Reference Books:**

1. U.S.B.R., Oxford and IBH Publication -- Design of small dams.
2. Justinn, Creager and Hinds,--Engg. For Dams.- Vol. I, II, and III
3. Varshney, - Design of hydraulic structures.
4. Leliavsky,- Design of hydraulic structures
5. SatyanarayanMurty, - Water resources Engg, New age international private Ltd.
6. Satyanarayan and R. Murthy - "Design of M.I. and Canal Structure", Wiley Eastern Ltd, New Delhi.
7. Bharat Singh, 'Irrigation', New Chand and Bros., Roorkee.
8. River Behaviour and Management and Training,- CBIP publication
9. "Water management" - Jaspal Sing, M.S.Acharya, Arun Sharma, Himanshu Publications.

**Guidelines Regarding Question Paper Setting:**

1. Q. No. 4 and Q. No. 8 are compulsory, and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No. 5, 6, 7

**End Semester Examination Paper Pattern**

Question No.	Based on Unit	Marks
1	1	10
2	2	10
3	3	10
4	1,2 & 3 (Compulsory)	15
5	4	10
6	5	10
7	6	10
8	4,5 & 6 (Compulsory)	15

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VIII**  
**TRANSPORTATION ENGINEERING – II**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
TR - II (PCC-CV803)	03	--	02	04	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: InSemesterEvaluation

CIE: ContinuousInternalEvaluation

ESE: End SemesterExamination

### Course Objectives

1. To study of various components of a railway track and geometric design of curves along railway tracks.
2. To impart knowledge of functioning of railway points, crossings and junctions.
3. To learn about the aircraft characteristics, airport planning and air traffic control.
4. To introduce the students to docks and harbor engineering.
5. To introduce the students to various types of bridges, bridge components, and design aspects of bridges.

### Course Outcomes:

After successful completion of this course students will be able to:

1. Perform geometric design for the railway tracks.
2. Plan the layout of different types of air terminals.
3. Carry out the surveys for layout of railways, airports and harbors.
4. Design various bridge components

## SECTION I

### Unit 1: Airport Engineering

(06)

1.1 Airport Engineering- Aircraft characteristics and their influence on airport planning. Airport planning: topographical and geographical features, air traffic characteristics, and development of new airports, factors affecting airport site selection. Airport obstruction: Zoning laws, classification of obstruction, imaginary surfaces, approach zones, turning zones.

1.2 Airport layout: runway orientation, wind rose diagrams, and basic runway length. Correction of runway length, airport classification, geometric design, airport capacity, runway configuration, taxiway design, geometric standards

### Unit 2: Airport layout details

(06)

2.1 Exit taxiways, holding aprons, location of terminal buildings, aircraft hangers and parking. Airport marking and lighting: marking and lighting of runways, taxiways and approach areas.

2.2 Terminal area, planning of terminal building, Apron: size of the gate position, number of gate position, aircraft parking system; Hanger: general planning considerations, blast considerations. Air traffic control: Air traffic control aids, Enroute aids, landing aids.

2.3 Airport Drainage: requirement of airport drainage, design data, surface drainage design, subsurface drainage design.

**Unit 03: Dock and Harbours Engineering**

**(06)**

3.1 Hydrographic Survey, Sea and tide, Wind Waves & cyclone, Siltation and erosion, Shipfeature, Traffic forecasting, Harbour layout, channel basin and berth, Breakwater, JettiesDolphins & mooring, Berth for crude oil, Locks,

3.2 Dry dock and slipwell, Carbohydrate equipment, Apparent, Transit shade, Ware Houses, Navigation Aids.

**SECTION II**

**Unit: 4 Railway Engineering**

**(06)**

4.1 Introduction, Permanent Way : Components, coning of wheels

4.2 Geometric design: Alignment, gradient, horizontal curves, super elevation, design problems on above.

4.3 Points & 4Crossing: Terms used, standard points and crossings, design of simple turnout various types of track junctions.

4.4 Stations and yards: purpose, location, site selection, types and general layouts of terminus, Junction.

**Unit: 5 Railway Engineering**

**(06)**

5.1 Signaling and interlocking—Introduction,

5.2 Construction and maintenance of railway track: methods, material required per KM of track, tools and plant used for plate laying,

5.3 Maintenance of Track, Modern trends in railways, Safety in railways

**Unit : 6 Bridge Engineering**

**(06)**

6.1 Classification of bridges, selection of site, Bridge Hydrology: determination of design discharge, linear water way, economical span, location of piers and abutments, afflux, scour depth, design problems on above topics.

6.2 Standard specification for bridges: - IRC loads, Railway bridge loading, forces acting on super structure. Design considerations, aesthetics of bridge design.

6.3 Types of bridge foundations, Bridge piers, Abutments, Wing walls, Bearings, Construction and maintenance of bridges-Introduction; Recent trends in bridges.

**Term Work**

Assignment on each unit and field visit report on airport/ railway/ bridge shall be submitted by the students.

**Text Books**

1. Airport Engineering by G.V. Rao. Rao, Tata McGraw Hill
2. Airport Planning & Design, by Khanna and Arora, Nemchand Bros, Roorkee
3. Harbour, Dock and Tunnel Engineering by R. Shrinivasan, Charotar Publishing House.
4. A Text book of Railway Engineering by Saxena and Aror, Dhanapat Rai & Sons Publication.
5. Railway Engineering by Rangwala, by Charotar Publication.
6. Bridge Engineering by PonnuswamyS,, Tata McGraw Hill

**Reference Books**

1. Railway Engineering- by Aggarwal M.M.
2. Railway and track Engineering- by Mundrey J.S.
3. Indian Railway permanent way manual – 1986.
4. Planning and Construction of Docks and Harbors–Quinn.
5. Docks and Harbour Engineering Oza, Charotar Publication House.
6. Airport Planning & Design by Khanna &Arrora.
7. Concrete Bridge Practice by Raina V K, Tata McGraw Hill
8. IRC:5-2015- Standard Specifications and Code of Practice for Road Bridges, Section I – General Features of Design
9. IRC:6-2017- Standard Specifications and Code of Practice for Road Bridges, Section II – Loads and Load Combinations

**Guidelines Regarding Question Paper Setting:**

1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No.5, 6, 7.

**End Semester Examination Paper Pattern**

Question No.	Based on Unit No.	Marks
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15
5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

**ELECTIVE-II (STRUCTURE GROUP)**

<b>Sr.No.</b>	<b>Name of Elective</b>
1.	Design of bridges
2.	Maintenance, Retrofitting, Rehabilitation Of Structure
3.	Advance Foundation Engineering
4.	Advanced Pre-stressed Concrete Design
5.	Structural Design of Foundation & Retaining Structures
6.	Advanced Design of Concrete Structures
7.	Dynamics of Structure
8.	Finite Element Method



**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech CIVIL SEMESTER VIII**  
**Professional Elective II: DESIGN OF BRIDGES (PCE-CV804)**

Course	Teaching Scheme					Evaluation Scheme			
	L	T	P	Credit	Scheme	Theory (Marks)		Practical(Marks)	
						Max.	Min. for passing	Max.	Min. for passing
El - II PCE-CV804	3	1	-	4	ISE	-	-	-	-
					CIE	30	12	-	-
					ESE	70	28	-	-

CIE: Continuous Internal Evaluation ISE: In Semester Evaluation ESE: End Semester Evaluation

**Course Objectives:**

1. To understand the types of bridges and its suitability.
2. To understand the design concept of bridges i.e. superstructure and substructure.

**Course Outcomes:**

After successful completion of course, the students will be able to

1. Classify the types of bridges and its components.
2. Assess the different kinds of loading on the bridge.
3. Design the different types bridges.
4. Analyze the substructures of the bridges.

## **SECTION I**

**Unit No. 1**

**(06)**

Introduction & Brief History of bridges, Classification, Importance of bridges, Components of bridges: Substructure -superstructure, Investigation for Bridges.

**Unit No. 2**

**(04)**

Standard specification for Road Bridges. I.R.C. bridge code, width of carriage way, clearances, loads to be considered i.e. D.L., L.L., Impact load, wind load, Earthquake load, Longitudinal force, Centrifugal force, buoyancy, Earth pressure, water current force, thermal force etc.

**Unit No. 3**

**(08)**

General design considerations. For R.C.C. & P.S.C. bridges. Traffic aspects for highway bridges. Aesthetics of bridge design, Relative costs of bridge components. Design of reinforced concrete, deck slab, Pigeaud's theory, beam and slab and T – beam, Courbon's theory.

## **SECTION II**

**Unit No. 4**

48

**(06)**

Construction Techniques – Construction of sub structure footing, piles, cassions, construction of reinforced earth retaining wall and reinforced earth abutments, super structure – erection method for bridge deck construction by cantilever method, Repair, Strengthening, and Rehabilitation of Existing Bridges.

### **Unit No. 5**

**(06)**

Design of sub structure – Abutments, Piers, Approach slab. (Numerical on Abutments, Pier)

### **Unit No. 6**

**(06)**

Different types of bridge Bearing and expansion joints , forces on bearings, Types of bearings, design of unreinforced elastomeric bearings, expansion joints. (Numerical on Bearings)

### **Practice Work**

One assignment per unit with minimum five questions.

### **Text Books**

1. Design of Bridge Structures, -T.R Jagadeesh and M.A.Jayaram, PHI Publications.
2. Bridge Enginnering – Rangwala, Charotar Publications.
3. Principles and practice of Bridge Engineering, S.P. Bindra ,Dhanapat Rai Publications.

### **Reference Books**

1. Reinforced Concrete Structures – Vol. II by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications.
2. Concrete Bridge Practice, Analysis, Design and Economics by Dr. V. K. RAINA, Tata McGraw- Hills Publishing Company Limited.
3. Bridge Engineering by S. Ponnuswamy, Tata McGraw-Hills Publishing Company Limited.
4. Design of Bridges by N. Krishna Raju, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
5. IRC Codes – IRC: 5, IRC: 6, IRC: 18, IRC: 27, IRC: 45, IRC: 78, IRC: 83.

### **Guidelines Regarding Question Paper Setting:**

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

### **Structure of question paper for End Semester Evaluation**

Question No.	Unit No.	Marks
1.	Theory question on Unit 1	12
2.	Theory question on Unit 2	11
3.	Theory question on Unit 3	12
4.	Theory question on Unit 4	11
5.	Theory question/ Numerical on Unit 5	12
6.	Theory question/ Numerical on Unit 6	12

Note-

1. Required data for Numerical should be provided in numerical, IRC codes are not allowed in examination.

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VIII**

**Professional Elective II: MAINTENANCE, RETROFITTING, REHABILITATION OF  
STRUCTURE(PCE-CV804)**

Course	Teaching Scheme				Evaluation scheme				
	L	T	P	Credit	Scheme	Theory (marks)		Practical (Marks)	
						Max	Min for passing	Max	Min for passing
<b>EI - II</b> (PCE-CV804)	03	01	--	4	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: In Semester Evaluation    CIE: Continuous Internal Evaluation    ESE: End Semester Examination

**Course Objectives:**

1. To understand the importance of maintenance of
2. To learn various repair techniques of damaged structures.

**Course outcomes :**After successful completion of this course students will be able to:

1. Understand types of damage to structure
2. Identify Causes of distress and damage
3. Classify different repair and retrofit techniques
4. Apply the repair and retrofitting techniques to damaged structure
5. Analyse damage structure and propose repair techniques
6. Design rehabilitation proposal for damaged structure

## **SECTION I**

### **UNIT-I**

**(06)**

Introduction –Introduction - rehabilitation, repair, retrofit/ strengthening, need for rehabilitation and retrofit/strengthening of structures. Importance of Maintenance various aspects of Inspection. Assessment procedure for evaluating a damaged structure routine and preventive maintenance. Effects on structures due to climate, temperature, sustained elevated temperature, Corrosion – Effects. Causes of deterioration, Various cracks in R.C. buildings, causes and effects. Corrosion mechanism and Stages of corrosion damage.

### **UNIT-II**

**(06)**

**Damage Assessment** Visual inspection, Non-Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Carbonation depth testing, Corrosion activity measurement Substrate preparation

Importance of substrate/surface preparation, General surface preparation methods and procedure, Reinforcing steel cleaning

### **UNIT-III**

**(06)**

Repair Materials - Various repair materials, Criteria for material selection, Methodology of selection, Health and safety precautions for handling and applications of repair materials Strength, Durability and Thermal properties, of concrete, Special mortars and concretes Polymer Concrete and Mortar Expansive cement, Quick setting compounds sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete, Grouting Materials Gas forming grouts, Sulfamate grouts, Polymer grouts, Acrylate and Urethane grouts. Bonding agents Latex emulsions, Epoxy bonding agents. Protective coatings Protective coatings for Concrete and Steel.

## **SECTION II**

### **UNIT-IV**

**(06)**

TECHNIQUES FOR REPAIR Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, . Overlays, Repair to active cracks, Repair to dormant cracks shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Corrosion of embedded steel in concrete,

### **UNIT-V**

**(06)**

RETROFITTING/Strengthening of structures Treatments to overcome low member strength, Deflection, strengthening of various corrosion damaged structural elements (slab, beam and columns) - Column jacketing, Beam jacketing, Beam Column joint jacketing, Reinforced concrete jacketing, Steel jacketing, FRP jacketing., Beam shear strengthening, Flexural strengthening. Strengthening for seismic loads, shear wall, base isolation system, dampers and other techniques

### **UNIT-VI**

**(06)**

Case Studies – Structural Audit, Rehabilitation of Heritage building, Retrofitting of structure, DEMOLITION AND DISMANTLING TECHNIQUES Non Engineering Demolition, Mechanical Method of demolition, Dismantling of building and reuse of material and fittings. - case studies.

### **TEXT BOOKS**

- 1 Shetty M.S, Concrete Technology – Theory and Practice, 10th Edition, S.Chand and Company, 2005
2. Concrete repair and maintenance Illustrated by Peter.H. Emmons, Galgotia publications Pvt. Ltd., 2001.
3. Ravishankar.K., Krishnamurthy. T.S, Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures
4. “Earthquake resistant design of structures” by Pankaj agarwal, Manish shrikande, PHI, 2006.

### **REFERENCE BOOKS**

1. Failures and repair of concrete structures by S. Champion, John Wiley and Sons, 1961. 51
2. Diagnosis and treatment of structures in distress by R. N.Raikar Published by R & D Centre of Structural Designers and Consultants Pvt.Ltd, Mumbai.

3. Handbook on repair and rehabilitation of RCC buildings, CPWD, Government of India.
4. Handbook on seismic retrofit of buildings, A. Chakrabarti et.al., Narosa Publishing House, 2010.
5. DovKominetzky.M.S, Design and Construction Failures, 8th Edition, Galgotia Publications Pvt. Ltd, 2008

**Practice Work:** One case study related to health monitoring of a structure, or Repair/Retrofit proposal for a structure or report of present status of Heritage building is compulsory. One assignment per unit with minimum five questions in each assignment.

**Guidelines Regarding Question Paper Setting:**

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

**End Semester Examination Paper Pattern**

Question No.	Based on Unit No.	Marks
1	1	11
2	2	12
3	3	12
4	4	12
5	5	12
6	6	11

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VIII**  
**PROFESSIONAL ELECTIVE II: ADVANCE FOUNDATION ENGINEERING**  
**(PCE-CV804)**

Course	Teaching Scheme				Evaluation scheme				
	L	T	P	Credit	Scheme	Theory (marks)		Practical (Marks)	
						Max	Min for passing	Max	Min for passing
El - II (PCC- CV804)	3	1	-	4	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

**ISE:** In Semester Evaluation    **CIE:** Continuous Internal Evaluation    **ESE:** End Semester Examination

**Course Objectives:**

1. To study different types of soils, foundation and their applications.
2. To learn the stability analysis of structure using specific foundation system.
3. To study the analysis of load carrying capacity of foundations.
4. To enhance the knowledge about structural foundations in weak soils.
5. To learn dynamic analysis of foundations for industrial machines
6. To study the types & analysis process for earth & water retaining structures.

**Course Outcomes:**

After successful completion of this course students will be able to:

1. Understand the different types of foundations & their necessities.
2. Select the suitable foundation system based on soil and loading conditions.
3. Calculate dimensions and capacity of shallow foundations.
4. Design the foundations for Industrial machines under dynamic loadings.
5. Understand suitable technique for weak soil to enhance the stability of foundations.
6. Analyse the earth and water retaining structures used for special functions.

## **SECTION – I**

**Unit 1: Shallow Foundations**

**(06)**

- 1.1 Types & shapes of shallow foundation, minimum depth of foundation
- 1.2 Calculation of bearing capacity of soil by Terzaghi's theory, IS Code method & Skempton's approach
- 1.3 Concept of proportioning of footings (Isolated), calculation of immediate and consolidation settlement, foundation on slopping ground etc.

- 1.4 Different shapes, bending moment diagrams & Dimensional analysis of rectangular & Trapezoidal combined footings
- 1.5 RCC design of Isolated box & slopped type footings with reinforcement details

**Unit 2: Raft Foundation** (06)

- 2.1 Introduction to raft or mat foundation, necessity & types of rafts
- 2.2 Analysis of bearing capacity and settlements of raft or mat foundation
- 2.3 Design guidelines for raft foundation, types of raft design, floating foundation & problems associated with floating foundation.
- 2.4 Analysis of raft or mat foundation by Rigid method (Conventional method) & Elastic plate method (IS Code method)
- 2.5 Calculation of soil pressure at different points in a raft foundation

**Unit 3: Pile Foundation** (06)

- 3.1 Introduction, necessity, advantages and classification of piles
- 3.2 Calculation of load capacity of single pile by static formulae in cohesive & cohesionless soils and by dynamic formulae, pile load test etc.
- 3.3 Group action of files, efficiency of group of piles, feld's rule, Seiler-Keeney formula, Converse-Labarre formula etc.
- 3.4 Concept of negative skin friction and its estimation, settlement in pile foundation, estimation of load on single pile in a group of pile etc.
- 3.5 Calculation of group capacity of pile in cohesive soil, under reamed pile – its application and installation techniques

## **SECTION – II**

**Unit 4: Machine Foundations** (06)

- 4.1 Introduction to machine foundation, types of machine foundations, terms related to dynamic loadings, static and dynamic design criteria etc.
- 4.2 Permissible amplitude of vibrations for different types of machines, calculation of probable amplitude, amplitude ratio & maximum amplitude, criteria for design of machine foundations,
- 4.3 Design criteria for foundations of reciprocating machines (IS2974-Part-I), design criteria for foundations of impact type machines (IS2974-Part-II),
- 4.4 Vibration Isolation & Its methods, vibration effects on soil etc.

**Unit 5: Sheet Piles** (06)

- 5.1 Introduction to sheet piles, types and uses of sheet piles
- 5.2 Analysis & design of cantilever sheet pile walls in cohesive & cohesionless (granular) soils,
- 5.3 Anchored bulkhead, free earth support and fixed earth support method

- 5.4 Introduction to coffer dams, different types of coffer dam, uses of cofferdams, construction techniques of cofferdams etc

**Unit 6: Foundations in difficult soils and soil stabilization (06)**

- 6.1 Introduction to difficult or weak soils, foundations in expansive soils, foundations in soft & compressible soils
- 6.2 Problems associated with foundation installation- ground water lowering and drainage, shoring and underpinning, different methods, damage and vibrations due to constructional operations.
- 6.3 Introduction to soil stabilization, methods of stabilization & their applications - mechanical stabilization, cement stabilization, lime stabilization, bituminous stabilization, chemical stabilization & stabilization by grouting

**Practice Work:**

1. One assignment on each unit containing at least 10 questions in each assignment
2. Problem practice from unit 1, 2, 3 and 4

**Reference books:**

1. “*Foundation Engineering Handbook- I*”, Van Nostrand Reinhold Company, 1975 by Winterkorn H.F. and Fang H. Y
2. “*Principles of Foundation Engineering*”, by Braja. M. Das, Cengage India Private Limited
3. “*Foundation Analysis & Design*”, by Joseph Bowles, McGraw-Hill Education; 5th edition March 2001
4. “*Foundation Design*“, by W. C. Teng, Prentice Hall of India PVT. LTD, New Delhi
5. “*Foundation Design*”, by N. S. V. Kamesware Rao, John Wiley & Sons Inc.
6. “*Advance Foundation Engineering*”, by T. G. Sitharam, CRC Press, 1<sup>st</sup> Edition 2019
7. “*Design Applications of Raft Foundations*”, by J. A. Hemsley, Published on 2000 by Thomas Telford
8. “*Soil Mechanics & Foundation Engineering*”, by V. N. S. Murthy, CBS Publishers & Distributors.

**Text Books:**

1. “*Foundation Engineering*”, by P. C. Varghese, Prentice Hall India Learning Private Limited
2. “*Raft Foundation Design and Analysis with a Practical Approach*”, by Sharat Chandra Gupta, New age Publisher 1997
3. “*Pile foundation Design & Construction*”, by Satyendra Mittal, CBS Publishers & Distributors Pvt. Ltd.



4. “*Soil Mechanics and Foundations*” by B. C. Punamia & Ashok Kumar Jain, Laxmi Publications
5. “*Soil Mechanics and Foundation Engineering*”, by Purushotama Raj, Published by Pearson Education India, Ltd.
6. “*Foundation Engineering*”, by B. J. Kasmalkar, Pune Vidyarthi GrihaPrakashan
7. “*Handbook of Machine foundations*”, by Srinivasulu P, Vaidyanathan C.V
8. “*Foundation Design Manual for Practicing Engineer*”, by Narayan Nayak, Dhanapat Rai Publications Pvt. Ltd.
9. “*Soil Mechanics & Foundation Engineering*”, by S. K. Gerg, Khana Publishers
10. “*Foundation Design*”, by W. C. Teng, Prentice Hall of India Pvt. Ltd., New Delhi
11. “*Foundations for Industrial Machines – Handbook for practicing Engineers*”, Dr. K. G. Bhatia, D-CAD Publications

### **Guidelines Regarding Question Paper Setting:**

1. Question paper consist of 2 sections & each section carries maximum 35 marks
2. Section – I is based on unit 1, 2 & 3, Section – II is based on unit 4, 5 & 6
3. Maximum 3 questions in each section.
4. Internal optional questions are allowed; weightage of optional question should not be more than 30% of total marks i.e., 21 marks out of 70 marks.
5. Make all questions compulsory.

### **End Semester Examination Pattern:**

<b>Question Number</b>	<b>Related to unit Number</b>	<b>Marking weightage</b>
<b>1</b>	1	10
<b>2</b>	2	12
<b>3</b>	3	13
<b>4</b>	4	13
<b>5</b>	5	12
<b>6</b>	6	10

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VIII**  
**PROFESSIONAL ELECTIVE II: ADVANCED PRESTRESSED CONCRETE**  
**Design (PCE-CV804)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Total credit	Scheme	Theory (Marks)		Practical (Marks)	
El - II (PCC-CV804)	3	1	-	4		Max	Min for Passing	Max	Min for Passing
					ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE – In Semester Evaluation    CIE – Continuous Internal Evaluation    ESE – End Semester Evaluation

**Course Objectives:**

5. To study Basic concept of prestressed concrete
6. To design the rectangular and I section beams for flexure.
7. To design the prestressed concrete beams for shear
8. To analysis and design of continuous beams upto two spans.
9. To analyse and design prestressed Concrete Pipes and Sleepers.
10. To design prestressed concrete bridges as per IRC loadings.

**Course Outcomes:**

After successful completion of course student will be able to design -

5. Prestressed Concrete Rectangular and I section beams for flexure and shear.
6. Continuous beams.
7. Prestressed Concrete Pipes and Sleepers
8. Prestressed concrete bridges as per IRC loadings

## **SECTION- I**

**Unit : 1**

**(07)**

- a) Analysis and Design of beams - Rectangular, Flanged and I sections, for Limit State of flexure, ultimate flexural strength, recommendations of I.S. codes.
- b) Analysis and Design of End Blocks in post tensional members -primary and secondary distribution zones, Bursting and spalling tensions.

**Unit : 2**

**(07)**

Shear strength of prestressed concrete beams - Mode of failure in beams, recommendations of I.S. code, ultimate shear strength of concrete, Design of shear reinforcement, Bond in prestressed concrete.

**Unit : 3****(04)**

Analysis and Design of Continuous (upto two spans) and fixed beams. Elastic analysis, Secondary moments, concordant cable, Linear transformations.

**SECTION- II****Unit : 4****(04)**

Analysis and Design of Prestressed Concrete structures such as concrete pipes and Sleepers.

**Unit : 5****(07)**

Analysis and Design of Portal Frames, Single Storey and Limited to two bays (Fixed and Hinged).

**Unit : 6****(07)**

Design of Pre-stressed concrete bridges (simply supported) for I.R.C. loadings or equivalent uniformly distributed loads.

**Text Books:-**

1. Fundamentals of Prestressed Concrete, N.C. Sinha and Sujitkumar Roy
2. IS 1343:2012, Code of Practice for *Prestressed Concrete*

**Reference books:-**

1. IS 1343: Code of Practice for Prestressed Concrete by Bureau of Indian Standards.
2. Prestressed Concrete, Guyon Y, Vol. I & II, John Wiley and Sons, New York.
3. Prestressed Concrete, N. Krishna Raju, Tata McGraw Hill Publications Company, New Delhi.
4. Prestressed Concrete, Lin T. Y , Tata McGraw Hill, New Delhi.
5. Prestressed Concrete Structures, Dayaratnam P.

**Guidelines regarding question paper setting:**

1. Section –I – Q.No-1 to Q.No-3 and Section –II – Q.No-4 to Q.No-6
2. All questions are Compulsory.
3. Internal option question are allowed, weightage of optional question should not be more than 30% of total marks i.e.21 marks out of 70 marks

**END SEMESTER EXAMINATION PAPER PATTERN**

Question No.	Based on Unit No.	Marks
1	1	12
2	2	12
3	3	11
4	4	12
5	5	12
6	6	11

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VIII**  
**PROFESSIONAL ELECTIVE II: STRUCTURAL DESIGN OF FOUNDATION & RETAINING STRUCTURES (PCE-CV804)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical Marks	
						Max Marks	Min for passing	Max Marks	Min for passing
El - II PCE- CV804	3	1	--	4	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

**ISE:** In Semester Evaluation    **CIE:** Continuous Internal Evaluation    **ESE:** End Semester Examination

**Course Objectives:**

1. To learn various foundation systems and their applications
2. To evaluate the load carrying capacity & stability of specify foundation system.
3. To learn analysis & design of different foundations with reinforcement details.
4. To enhance the knowledge about reinforcement curtailments with economy.
5. To study the structural construction in water bodies as retaining structures.
6. To study the various forces acting on modern foundation techniques.

**Course Outcomes:**

After successful completion of this course students will be able to:

1. understand the different types of foundations & their necessities
2. Select the suitable foundation system based on soil and loading conditions.
3. Analyse the different types of loading acting on foundation system.
4. Design the foundation for lighter & heavy structures.
5. Learn the reinforcement curtailments in foundation systems.
6. Design the vertical walls to retain water or soil on one side of wall

## **SECTION – I**

**Unit 1: Shallow Foundations – Combined footing**

**6 hrs.**

- 1.1 Introduction to combined footings, necessity & types of combined footings
- 1.2 Dimension analysis of rectangular & Trapezoidal combined footings
- 1.3 Design of slab type combined footing with reinforcement details

- 1.4 Design of slab-beam type combined footing with reinforcement details

**Unit 2: Shallow Foundations – Raft Foundation** **6 hrs.**

- 2.1 Introduction to raft or mat foundation, necessity & types of raft
- 2.2 Design of raft as a slab with reinforcement details (without primary & secondary beams)
- 2.3 Design of raft as slab including primary peripheral beams with proper reinforcement details
- 2.4 Design of raft as a slab including both primary & secondary beam with proper reinforcement details

**Unit 3: Deep Foundations – Pile Foundation** **6 hrs.**

- 3.1 Introduction to pile foundation, necessity, classifications of pile foundation.
- 3.2 Design of single pile with reinforcement details
- 3.3 Introduction to group of piles, pile cap & efficiency of group of pile
- 3.4 Design of pile cap for a group of 2, 3, 4 and 6 piles with reinforcement details

**SECTION – II**

**Unit 4: Deep Foundations – Well Foundation** **6 hrs.**

- 4.1 Introduction to well foundation, necessity & types of well foundations
- 4.2 Elements of well foundation, shapes of well foundation, installation etc.
- 4.3 Forces acting on well foundation & lateral stability analysis
- 4.4 Problems associated with sinking of well & remedial measures
- 4.5 Tilt, shift & techniques to overcome, health problems of workers etc.

**Unit 5: Retaining Structures** **6 hrs.**

- 5.1 Introduction, functions & types of retaining wall
- 5.2 Stability analysis of cantilever type retaining wall
- 5.3 Reinforcement curtailment in cantilever type wall, use of shear key etc.
- 5.4 Design of cantilever type retaining wall for various types of backfill conditions with reinforcement details

**Unit 6: Break water Structures** **6 hrs.**

- 6.1 Introduction, Necessity, functions and types of breakwater
- 6.2 Parameters for construction of breakwater
- 6.3 Methods of constructions of breakwaters
- 6.4 Stability analysis and design of breakwater

**Practice Work:**

1. One assignment on each unit containing at least three problems to practice
2. Students should visit at least one foundation site during academic term

**Reference books:**

1. *“Foundation Engineering Handbook- I”*, Van Nostrand Reinhold Company, 1975 by Winterkorn H.F. and Fang H. Y
2. *“Pile Foundation Analysis and Design”*, Poulos, H.G. and Davis, E.H. (1980), John Wiley and Sons, New York.
3. *“Foundation Analysis & Design”*, by Joseph Bowles, McGraw-Hill Education; 5th edition March 2001
4. *“Foundation Design”* by W. C. Teng, Prentice Hall of India PVT. LTD, New Delhi
5. *“Basics of retaining wall design”*, by Hugh Brooks, HBA Publications, Incorporated (23 May 2018)
6. *“Earth Pressure and Earth-Retaining Structures”*, by Clayton Chris R.I, Woods Rick. I, Bond Andrew J, Publisher: Taylor & Francis Inc.
7. *“Design Applications of Raft Foundations”*, by J. A. Hemsley, Published on 2000 by Thomas Telford

**Text Books:**

1. *“Foundation Engineering”*, by P. C. Varghese, Prentice Hall India Learning Private Limited
2. *“Raft Foundation Design and Analysis with a Practical Approach”*, by Sharat Chandra Gupta, New age Publisher 1997
3. *“Pile foundation Design & Construction”*, by Satyendra Mittal, CBS Publishers & Distributors Pvt. Ltd.
4. *“Soil Mechanics and Foundations”* by B. C. Punamia & Ashok Kumar Jain, Laxmi Publications
5. *“Soil Mechanics and Foundation Engineering”*, by Purushotama Raj, Published by Pearson Education India, Ltd.
6. *“Foundation Engineering”*, by B. J. Kasmalkar, Pune Vidyarthi Griha Prakashan
7. *“Advance Foundation Engineering”*, by V.N.S. Murthy, CBS Publishers & Distributors Pvt. Ltd.
8. *“Foundation Design Manual for Practicing Engineer”*, by Narayan Nayak, Dhanapat Rai Publications Pvt. Ltd.

**Guidelines regarding question paper setting:**

1. Section –I – Q.No-1 to Q.No-3 and Section –II – Q.No-4 to Q.No-6
2. All questions are Compulsory.
3. Internal option question are allowed, weightage of optional question should not be more than 30% of total marks i.e.21 marks out of 70 marks

**END SEMESTER EXAMINATION PAPER PATTERN**

Question No.	Based on Unit No.	Marks
1	1	12
2	2	12
3	3	11
4	4	12
5	5	12
6	6	11

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VIII**  
**PROFESSIONAL ELECTIVE II: ADVANCED DESIGN OF CONCRETE**  
**STRUCTURES(PCE-CV804)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Total credit	Scheme	Theory (Marks)		Practical (Marks)	
EL-II (PCC-CV804)	3	1	-	4		Max	Min for Passing	Max	Min for Passing
					ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE – In Semester Evaluation

CIE – Continuous Internal Evaluation

ESE – End Semester Evaluation

**Course Objective:**

1. To understand the concept and design of large span concrete roofs and deep beam
2. To analyze the stresses in chimney, design of chimney
3. To understand the design of elevated water tank and its elements and retaining wall.
4. To understand yield line analysis and design of slab.

**Course Outcome:** After successful completion of course student will be able to

1. Analysis and design of large span concrete roofs and design flat slab as per IS 456 – 2000
2. Analysis and design deep beams.
3. Analysis of stresses in concrete chimney and design the chimney
4. Analysis and design overhead water tank with codal provision of 3370-2009
5. Analysis and design of cantilever and counter fort retaining wall.
6. Describe yield line theory and analyze rectangular and circular slab by yield line theory

**SECTION- I**

**Unit: 1**

**(06)**

Large span concrete roofs with detail Classification

Behavior of Flat slabs, Direct design and equivalent frame method with Codal provisions

**Unit: 2**

**(06)**

Analysis of deep beams and design as per IS 456-2000

**Unit: 3**

**(06)**

Analysis of stresses in concrete chimneys with un cracked and cracked sections, Codal



provisions, Design of chimney.

## **SECTION- II**

### **Unit: 4**

**(06)**

Overhead water tanks, rectangular and circular with flat bottom, spherical and conical tank roofs, Staging , Design based on IS 3370 -2009

### **Unit: 5**

**(06)**

Analysis and Design of cantilever and counter fort retaining walls with horizontal and inclined surcharge.

### **Unit : 6 (06)**

Yield line analysis of slabs, virtual work and equilibrium method of analysis, simply supported rectangular slabs with corners held down uniform and concentrated loads, design of simply supported rectangular and circular slabs

**Practice work:** At least one assignment on each unit consisting of four questions.

#### **Text books :**

7. Reinforced Concrete Structural Elements- Purushothaman. P, Tata Mc Graw Hill
8. Design and Construction of Concrete Shell Roofs-G.S.Ramaswamy
9. Reinforced Concrete – Ashok K Jain, Nem Chand Bros. Roorkee
10. Plain and Reinforced Concrete – Jain &Jaikrishna, Vol. I & II, Nem Chand Bros. Roorkee
11. Reinforced Concrete Chimneys- Taylor C Pere,
12. Yield Line Analysis of Slabs- Jones L L, Thomas and Hudson
13. Reinforced Concrete, Mallick & Gupta- Oxford & IBH
14. IS 456-2000
15. IS2210-1998- Criteria for design of reinforced concrete shell structures and folded plates
16. IS 4998-1998- Criteria for design of reinforced concrete chimneys
17. IS 3370- 2009- Part (1 to 4) Code of Practice for concrete structures for the storage of liquids

#### **Reference Books**

1. Design of deep girders, Concrete Association of Indi
2. Reinforced concrete design 9th Edition by Abi O Aghayere, pearsonindia

**Guidelines regarding question paper setting:**

1. Section –I – Q.No-1 to Q.No-3 and Section –II – Q.No-4 to Q.No-6
2. All questions are Compulsory.
3. Internal option question are allowed, weightage of optional question should not be more than 30% of total marks i.e.21 marks out of 70 marks.

**END SEMESTER EXAMINATION PAPER PATTERN**

Question no	Based on Unit no	Marks
1	1	12
2	2	12
3	3	11
4	4	12
5	5	12
6	6	11

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VIII**  
**PROFESSIONAL ELECTIVE II: DYNAMICS OF STRUCTURE(PCE-CV804)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical(Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL-II (PCE-CV704)	03	01	--	04	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: In Semester Evaluation    CIE: Continuous Internal Evaluation    ESE: End Semester Examination

**Course Objectives:**

1. To analyse damped and undamped single degree of freedom system subjected to different types of loading.
2. To analyse single degree of freedom system by piece wise exact method.
3. To analyse multi degree of freedom system by various methods.
4. To analyse beams in flexure subjected to free and forced vibration.

**Course Outcomes:** After successful completion of this course students will be able to:

1. Differentiate between damped and undamped system, free and forced vibration.
2. Write the equation of motion for single and multi degree of freedom system.
3. Determine natural frequency, period.
4. Understand the resonance condition,
5. Determine natural frequencies and mode shapes for multi degree of freedom system.
6. Determine the model contribution.

## **SECTION - I**

**Unit 1: Single degree of freedom (SDOF) system subjected to general loading      6hrs**

- 1.1 Mathematical models, Equation of motion
- 1.2 SDOF system subjected to free vibration
- 1.3 Damping, Types of damping
- 1.4 Response to harmonic loading, Resonance
- 1.5 Response to support motion, Transmissibility, Vibration isolation

**Unit 2: SDOF system subjected to periodic and impulsive loading      6 hrs**

- 2.1 SDOF system subjected to Fourier series loading
- 2.2 SDOF system subjected to rectangular pulse
- 2.3 Introduction to frequency – Domain analysis

**Unit 3: SDOF system subjected to general dynamic loading      6 hrs**

- 3.1 Duhamel's' integral, Application to simple loading cases
- 3.2 Numerical evaluation of response integral
- 3.3 Piece wise exact method

## **SECTION - II**

### **Unit 4: Multi degree of freedom (MDOF) system**

**6 hrs**

- 4.1 Selection of degrees of freedom, Formulation of equations of motion
- 4.2 Structure matrices, Static condensation
- 4.3 Free vibration - Eigen value problem
- 4.4 Frequencies and Mode shapes, Determination of natural frequencies and mode shapes by Stodola-Vianello method
- 4.5 Orthogonality conditions

### **Unit 5: Discrete systems**

**6 hrs**

- 5.1 Fundamental mode analysis, Rayleigh method
- 5.2 Response of MDOF systems to dynamic loading
- 5.3 Mode superposition method, Coupled and uncoupled equations of motion
- 5.4 Modal contribution

### **Unit 6: Distributed - parameter systems**

**6 hrs**

- 6.1 Partial differential equations of motion
- 6.2 Free and forced Vibration
- 6.3 Application to beams in flexure

**Practice Work:** One assignment on each unit.

#### **Text Books:**

1. "Structural Dynamics", Mario Paz, CBS Publication
2. "Mechanical Vibrations", G. R. Grover, Roorkee University, Roorkee
3. "Earthquake Resistant Design of R. C. C. Structures", S. K. Gosh
4. "Earthquake Resistance Design of Structure", S. K. Duggal, Oxford University Press
5. "Earthquake Resistance Design of Structure", Vinod Hosur, Wiley Publication

#### **Reference Books:**

1. "Dynamics of Structures - Theory and Applications to Earthquake Engineering", A.K. Chopra, Prentice Hall Publications
2. "Earthquake Resistant Structures", D.J. Dowrick, John Wiley Publication
3. "Dynamics of Structures", R. M. Clough and Ponian, McGraw Hill Co., New Delhi

#### **Guidelines Regarding Question Paper Setting:**

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

#### **End Semester Examination Paper Pattern**

<b>Question No.</b>	<b>Based on Unit No.</b>	<b>Marks</b>
1.	1	11
2.	2	12
3.	3	12
4.	4	11
5.	5	12
6.	6	12

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech Civil Semester VIII**  
**PROFESSIONAL ELECTIVE II: FINITE ELEMENT METHOD(PCE-CV804)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Total credit	Scheme	Theory (Marks)		Practical (Marks)	
<b>EI - II</b> <b>(PCC-CV804)</b>	3	1	-	4		Max	Min for Passing	Max	Min for Passing
					ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE – In Semester Evaluation    CIE – Continuous Internal Evaluation    ESE – End Semester Evaluation

**Course Objectives:**

1. To impart knowledge of element stiffness matrix formulation for 1D,2D and 3D elements
2. To demonstrate applications of finite element method in structural engineering in a wide perspective.
3. To provide knowledge of finite element method to model and solve continuum structures by using FEM based softwares.

**Course Outcomes:** After successful completion of course student will be able to design -

1. Comprehend basic concept of F.E.M. and formulation of  $[k]$  for spring, bar and truss element with their applications.
2. Develop element stiffness matrix for beam and frame element and solve the problems of continuous beams and portal frames.
3. Analyze plane stress/strain problems by using theory of elasticity.
4. Demonstrate the concept of displacement function and its convergence requirements.
5. Develop shape functions in Cartesian and natural coordinate system and apply concept of isoparametric elements.
6. Solve three dimensional and axisymmetric problems by using finite element method.

## **SECTION- I**

**Unit : 1**

**(07)**

Basic concept of finite element analysis, Discretization, nodes, element incidences, formulation of element stiffness matrices for spring, bar and plane truss elements. Solutions for unknown nodal displacements; Applications of method to spring, bar and plane truss problems

**Unit : 2**

**(06)**

Formulation of element stiffness matrices for beam and plane portal frame element by direct method; Transformation of matrix from local to global system; Numbering of nodes; minimization of band width; force displacement relations; Solution for displacement unknowns; Application of method to plane truss; Continuous beams and plane portal frames.

**Unit : 3****(06)**

Elementary theory of Elasticity: Stress strain relation; Strain displacement, relations; plane stress and plane strain problems; Compatibility conditions; differential equations of equilibrium; equations for two dimensional and three dimensional problems.

**SECTION- II****Unit : 4****(06)**

Principle of minimum potential energy; variational method; continuum problems; Two dimensional Elements; use of displacement functions; Pascal's triangle; triangular and rectangular elements; Formulation of element stiffness matrix.

Convergence requirements – Selection of the order of polynomial, conforming and non-conforming elements, Effect of element aspect ratio, finite representation of infinite bodies.

**Unit : 5****(05)**

Shape function in Cartesian and natural co-ordinate system, Lagrange's interpolation formulae, concept of iso-parametric element, relation between Cartesian and natural coordinate system, Jacobian matrix, one and two dimensional Iso-parametric elements.

**Unit : 6****(06)**

Introduction to three-dimensional problem, various three-dimensional elements, Axisymmetric problems, formulation of stiffness matrix of three dimensional and axisymmetric elements.

**Text Books:-**

1. P.N.Seshu "Finite Element Analysis", PHI learning private Lim. Delhi, 2013.
2. J. N. Reddy. "An Introduction to the Finite Element Method" McGraw Hill, 3<sup>rd</sup> Edition, New York, 3<sup>rd</sup> edition, 2006.
3. Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and Applications of Finite Element Analysis", 2003

**Reference books:-**

1. Klaus-Jurgen Bathe, "Finite Element Procedures in Engineering Analysis", 1982
2. T. R. Chandrupatla and A.D. Belegundu, "Introduction to Finite Element in Engineering", Prentice Hall of India Private Limited, 3<sup>rd</sup> Edition, 2002.
3. Zienkiewicz.O.C. & Taylor.R.L., "The Finite Element Method- Vol I & Vol II Tata McGraw-Hill Publishing Company Limited, 6<sup>th</sup> Edition, 2005.
4. C. S. Desai & J. F. Abel "Introduction to Finite Element Method", AEP, 1<sup>st</sup> Edition, 1972.

**Guidelines regarding question paper setting:**

1. Section –I – Q.No-1 to Q.No-3 and Section –II – Q.No-4 to Q.No-6
2. All questions are Compulsory.
3. Internal option question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks

**END SEMESTER EXAMINATION PAPER PATTERN**

Question No.	Based on Unit No.	Marks
1	1	12
2	2	12
3	3	11
4	4	12
5	5	12

6	6	11
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**ELECTIVE-III**

<b>Sr.No.</b>	<b>Name of Elective</b>
1.	Hydrology And Watershed Management
2.	Site Investigation Methods And Practices
3.	Industrial Waste Treatment
4.	AdvancedConstructionTechniques
5.	Engineering Geology
6.	Valuation Of Real Properties
7.	Air Pollution And Control
8.	Construction Practices
9.	Water Power Engineering

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech CIVIL SEMESTER VIII**  
**PROFESSIONAL ELECTIVE III: HYDROLOGY AND WATERSHED**  
**MANAGEMENT(PCE-CV805)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL- III (PCE-CV805)	03	01	-	04	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: InSemesterEvaluation CIE: ContinuousInternalEvaluation ESE: End Semester Examination

**Course Objectives:**

1. To study the evolution of watershed management concepts
2. Know the major components of watershed management and its effect on human and environment
3. Have knowledge of technologies used to develop watershed management
4. To understand the subject of hydrology and watershed management with help of various hydrological software

**Course Outcomes:** After completing of this course, student will be able to:

1. Able to understand the importance of watershed management and its past trends
2. Able to understand with different methods of watershed management for sustainable development.
3. Know the various runoff methods helps for proper planning of watershed management
4. Decide the selection of soil conservation structures, list of factors affecting and its suitability

## **Section- I**

**Unit No.1 Runoff and River Gauging**

**(06)**

- 1.1 Estimation of Runoff by Curve Number Method, Rational Method and using Empirical formulas, Stage –Discharge Measurement
- 1.2 Runoff Simulation Models (HEC)

**Unit No.2 Design Flood**

**(06)**

- 2.1 Definition and causes of Floods, Design Flood and its Importance
- 2.2 Estimation of Design Flood in Gauged and Ungauged Catchments
- 2.3 Flood Frequency Analysis, Rainfall Intensity-Duration and Frequency Relationships



**Unit No.3 Flood Routing****(06)**

3.1 Inflow-Outflow Relationship, Hydrologic Channel Routing, Hydrologic Reservoir Routing, Flood Routing Machines

3.2 Flood Forecasting, Flood Control Measures

**Section- II****Unit No. 4 Soil Erosion and Conservation****(06)**

4.1 Soil erosion Agents, Types of soil erosion due to water

4.2 Estimation of Soil Erosion by Soil Loss Models, Sediment Outflow Models, Bed Load Models and Sedimentation Models of water storage structures Soil Conservation Practices Erosion Control Structures for Agricultural and Nonagricultural Lands (viz. Contouring, Bunds Terraces, Gully Control Structures etc.)

**Unit No.5 Water Harvesting****(06)**

5.1 Watershed: Concept and Characteristics, Elements of Watershed Management, Watershed Models, Water Conservation/Harvesting Measures through Appropriate Technology viz. Contour Methods, Check Dams, Ponds, Rooftop Rainwater Harvesting etc.

5.2 Integrated Water Resources management, Conjunctive Use, Groundwater Recharge, Application of Remote Sensing and GIS

**Unit No.6 River Basin Management****(06)**

6.1 Types of Rivers and their characteristics, Indian rivers and their classification, Behavior of Rivers, River Regime theory, Meandering, Control and Training of Rivers River Basin Systems, Actions Causing Disturbance in Stream System and their Impacts

6.2 Environmental Effects of Hydraulic Structures, Water Quality in Reservoirs, Stream Pollution, River Action Plans, Stream Restoration

**Practice Work:**

1. At least 2 assignments based on each unit
2. Field visit to river-gauging site
3. Preparing Watershed Management Report

**Reference Books:**

1. Hydrology and Soil Conservation Engineering: By, Ghashyam Das (Prentice-Hall India)
2. Irrigation Engineering (Including Hydrology): By, R.K.Sharma, T.K. Sharma (S.Chand)
3. Hydrology- Principles, Analysis, Design: By H.M.Raghunath (Wiley Eastern Limited)
4. Manual of Soil and Water Conservation Practices: By Gurmel Singh, VenkatRamanG.Sastry, B.P.Joshi (Oxford and IBH)
5. Watershed management: By, J.V.S. Murthy. (New Age International Publishers)
6. River Morphology: By, R.J. Garde. (New Age International Publishers)
7. Water Resources Engineering: By Ralph A. Wurbs and Wesley P. James (Prentice-Hall India) 72

**Guidelines Regarding Question Paper Setting:**

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70marks.

**End Semester Examination Paper Pattern**

<b>Question No.</b>	<b>Based on Unit No.</b>	<b>Marks</b>
1	1	12
2	2	12
3	3	11
4	4	11
5	5	12
6	6	12

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech CIVIL SEMESTER VIII**  
**PROFESSIONAL ELECTIVE III: SITE INVESTIGATION METHODS AND**  
**PRACTICES(PCE-CV805)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL-III (PCE-CV805)	03	01	--	04	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: InSemesterEvaluation

CIE: ContinuousInternalEvaluation

ESE: End SemesterExamination

**Course Objectives:**

1. To access the general suitability of the site
2. To know the nature of each stratum and engineering properties of the soil and rock, which may affect the design and mode of construction of proposed structure and foundation.
3. To foresee and provide against difficulties that may arise during construction due to ground and other local conditions.
4. To investigate the occurrence or causes of all natural and manmade changes in conditions and the results arising from such changes.
5. To achieve safe and economical design of foundations and temporary works.

**Course Outcomes:**At the end of successful completion of course, the students will be able to--

1. State the importance of site investigation in Civil Engineering process
2. Describe different site investigation methods
2. Illustrate different subsurface exploration by nondestructive test
4. Identify the various soil exploration methods for soil sampling
5. Examine the various field and lab test on soil
6. Interpret how to write the technical report for site investigation

## **SECTION I**

**Unit: 1 Introduction to Site investigation** (06)

- 1.1 Introduction, the Importance of Site Investigation,
- 1.2 Purposes of a Site Investigation, Objectives, Need for Site investigation, Advantages of Site Investigation,
- 1.3 Phases in site investigation process, Approach to site investigation.

**Unit: 2 Methodology of site investigation** (06)

- 2.1 Preliminary site investigations: Preliminary desk study,

- 2.2 Topographical maps, Geological records, mining records,
- 2.3 Air-photography and remote sensing, Photogrammetry, Air-photo interpretation,
- 2.4 Site walk-over survey, Reconnaissance of site works.

**Unit: 3 Site Investigation using Non-Destructive Tests (06)**

- 3.1 Introduction to Non-Destructive Tests, Electrical Methods,
- 3.2 Magnetic Methods, Gravity Methods,
- 3.3 Acoustic Emission Methods, Seismic Methods

## **SECTION- II**

**Unit: 4 Site investigation using in situ testing (06)**

- 4.1 Introduction, Penetration testing - Standard penetration test & Cone penetration test,
- 4.2 Strength and compressibility testing - Field vane shear test, Pressure meter test, Plate loading test.

**Unit: 5 Sampling (06)**

- 5.1 Introduction, Sample sizes, Soil Disturbance, Soil disturbance during drilling ,
- 5.2 Soil disturbance during sampling ,Disturbance after sampling , Undisturbed sampling techniques ,
- 5.3 Sand Sampling, Preparation of disturbed samples for testing ,Preparation of undisturbed samples for testing.

**Unit: 6 Laboratory testing for site investigation (06)**

- 6.1 Introduction, Purpose of soil testing, Purpose & Significance of following test – Soil classification tests , Particle size distribution tests (Sieve analysis, Hydrometer analysis) , tests (Liquid limit, Cone penetrometer test, Plastic limit) ,Compaction tests (Proctor compaction test) , Particle density(Specific gravity) determination ,
- 6.2 Tests for Geotechnical parameters - Strength tests (CBR test, Lab vane test, Direct shear test, Triaxial test) ,Seepage and permeability tests
- 6.3 Technical Report writing-Standard format for a site investigation report

**Text Book**

1. Site Investigation Practice by Joyce, M.D.; ESN. SPON Publishers, 1982.
2. Instrumentation in geotechnical engineering by K.R. Saxena and V.M. Sharma.
3. Geotechnical Engineering Investigation Manual by R.E. Hunt, Mc Graw Hill Co. New York
4. Geotechnical and Geophysical Site Characterization, An-Bin Huang, Paul W Mayne, CRC Press, 2008, ISBN 0415469368, 9780415469364.
5. Advances in Site Investigation Practice by Craig C., ICE Publishing.

**References Books:**

1. Subsurface exploration and sampling of soils for Civil Engg. purposes by Hvorslev M.J.
2. Site Investigation, by C. R. I. Clayton, M. C. Matthews and N. E. Simons, Second Edition.
3. Compendium of Indian Standards on Soil Engineering Parts 1 and II 1987 - 1988.
4. Measurement of Engineering Properties of Soils by E. Saibaba Reddy , K. Rama Sastri , New Age International (P) Ltd., Publishers
- 5 In Situ Tests in Geotechnical Engineering by Monnet Jacques ; John Wiley & Sons Inc. Publisher
6. Soil Testing for Engineers by S. Mittal&J. P. Shukla;Khanna Publishers .

**Guidelines Regarding Question Paper Setting:**

1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No.5, 6, 7.

**End Semester Examination Paper Pattern**

<b>Question No.</b>	<b>Based on Unit No.</b>	<b>Marks</b>
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15
5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech CIVIL SEMESTER VIII**  
**PROFESSIONAL ELECTIVE III: INDUSTRIAL WASTE TREATMENT**  
**(PCE-CV805)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL-III (PCE-CV805)	03	01	--	04	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: InSemesterEvaluation CIE: ContinuousInternalEvaluation ESE: End SemesterExamination

**Course Objectives-**

1. To provide students the necessary knowledge and concepts of advancements/emerging techniques of treatment in physical, chemical and biological treatment processes.
2. To impart students with the skill of design and operation of wastewater treatment plants based on latest technology.
3. To provide students prerequisite knowledge necessary for higher studies and research in the field of wastewater treatment

**Course Outcomes-**

Student will be able to,

1. Explain & apply the concepts of unit operation & processes for advanced treatment of wastewater.
2. Analyse & evaluate the advanced treatment systems used in wastewater treatment.
3. Design advanced treatment facilities for wastewater.

**SECTION- I**

**Unit : 1**

**(07)**

Use of water in industry, sources of wastewater, quality and quantity variations in waste discharge, water budgeting, characterization and monitoring of wastewater flow, stream standards and effluent standards. Miscellaneous methods of dissolved solids removal, sludge disposal methods

**Unit : 2**

**(06)**

Waste volume and strength reduction, in-plant measure, good housekeeping, process change, leakage prevention, segregation and recycling Neutralization, equalization and proportioning of waste

**Unit : 3**

**(05)**

Water Quality monitoring of Streams, Self purification of streams, B.O.D.reaction rate, D.O. sag curve and D.O. deficit calculations.

## **SECTION- II**

### **Unit : 4** (06)

Different types of waste treatment & their selections. Wetland and aquatic treatment systems; Types, application, Treatment kinetics and effluent variability in constructed wetlands and aquatic systems, Free water surface and subsurface constructed wetlands.

### **Unit : 5** (07)

Manufacturing processes in major industries, water requirements, wastewater sources, composition of wastes, Viz. sugar, distillery, dairy, pulps, paper mill, fertilizer, tannery, chemical, steel industry, power plants, textile Treatment flow sheets, alternative methods of treatment, factors affecting efficiency of treatment plant. Anaerobic sludge blanket processes, Design considerations for up flow Anaerobic Sludge Blanket process.

### **Unit : 6** (05)

Water pollution control act, organizational set up of central and state boards for water pollution control, classification of river on water use, minimal national standards, socio-economic aspects of water pollution control.

#### **Text Books:**

1. Metcalf and Eddy “Wastewater Engineering Treatment and Reuse”, Tata McGraw Hill Publication, 6th Reprint. 2003.
2. Hammer M. J and Hammer M. J, “Water and Wastewater Technology”, PHI learning private limited, 6th Edition, 2008.

#### **Reference Books:**

1. Industrial Waste Treatment by Nelson Meneroo
2. Industrial Waste Treatment by Rao & Datta
3. Droste, Ronald L “Theory and Practice of Water and Wastewater Treatment”, John Wiley & Sons Publication, 1st Edition, 1997.
4. Renolds T. D, and Richards, P. A, “Unit operations and processes in Environmental Engineering”, PWS Publishing Company, 2nd Edition, 1996.

#### **Guidelines Regarding Question Paper Setting:**

1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No.5, 6, 7.

### **End Semester Examination Paper Pattern**

Question No.	Based on Unit No.	Marks
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15

5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.Tech CIVIL SEMESTER VIII**  
**PROFESSIONAL ELECTIVE III: ADVANCED CONSTRUCTION TECHNIQUES**  
**(PCE-CV805)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL-III (PCE-CV805)	03	01	--	04	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: In Semester Evaluation

CIE: Continuous Internal Evaluation

ESE: End Semester Examination

**SECTION-I**

**Unit : 1** **(06)**

**1.1 COMPOSITE CONSTRUCTION:** Composite/snoncomposite action; composite steel-concrete construction.

**1.2 FORMWORK:-** Material for formwork, special types of formwork, design of formwork.

**Unit : 2** **(06)**

**2.1 NEW MATERIAL** of construction such as geosynthetics, Epoxy resins, Adhesives, MDF, FRC, FRP, Polymer-based composites.

**Unit : 3** **(06)**

**3.1 GROUND IMPROVEMENT** by Vibro Compaction, Soilcrete, Soil fracturing (SoilFrac), Soil Nailing, Vacuum Consolidation, Gabions and Cribbs.

**SECTION-II**

**Unit : 4** **(06)**

**4.1 COFFER DAMS:** Types, requirements, Selection criteria, Design features, Leakage points and leakage prevention in coffer dams. **Caissons:** Materials used, Sinking loading of caissons

**Unit : 5** **(06)**

**5.1 REHABILITATION OF BRIDGES:** Necessity and methods of strengthening, preservation of bridges.

**5.2 RETAINING STRUCTURES** like diaphragm walls, advanced methods of their construction.

**Unit : 6** **(06)**

**6.1 CONSTRUCTION OF CONCRETE PAVEMENT** by techniques like vacuum processing, vibrated concrete, Roller-compacted concrete.



**6.2 USE OF TECHNIQUES** like, Sanitary Landfills, vacuum dewatering, Foundation dewatering, foundation strengthening.

**Reference books:**

1. Handbook of Composite Construction Engg---G.M.Sabanis
2. Formwork design and construction-----Wynn
3. Waterpower Engineering—Dandekarsharma
4. Bridge Engineering-----Raina
5. Bridge engineering Punnuswamy
6. Concrete Technology----- M.S.Shetty S.Chand publication
7. NPTL Course on Advanced Construction Technology.

**Guidelines Regarding Question Paper Setting:**

1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No.5, 6, 7

**End Semester Examination Paper Pattern**

Question No.	Based on Unit No.	Marks
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15
5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.TECH CIVIL SEMESTER VIII**  
**PROFESSIONAL ELECTIVE III: ENGINEERING GEOLOGY (PCE-CV805)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EI - III (PCC-CV805)	03	1	--	04	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

**Course Objectives:**

1. Minerals, Rocks and soils constitute earth materials. They play a vital role in the site evaluation and operations in civil engineering practice.
2. The knowledge about the nature of the rocks in tunneling and construction of roads.
3. To know geological features like faults, joints, beds, folds are found, they have to be built.

**Course Outcomes:**

After completing of this course, student will be able to:

1. Identify and classify the different types of minerals and rocks with their civil Engineering significance.
2. Interpret the different types of geological structures with emphasis on civil engineering aspects.
3. Identify the phenomenon of earthquake and landslides along with their civil engineering mitigation.
4. Acquire knowledge about groundwater and buildingstones.
5. Investigate the suitability of site for construction of dams, reservoirs, bridges and tunnels etc.

## **SECTION I**

**Unit No.1 Introduction and Physical Geology: (07)**

1.1.Introduction:Definition, subdivisions of geology, scope of Engineering Geology.

1.2. Physical Geology:Interior of the Earth. Types of volcanic eruption andproducts. Types of weatheringand its civil engineering significance. Geological work of river- Erosionand deposition processes and features, Transportation process, Civil Engineering Significance.

**Unit No.2 Mineralogy and Petrology (06)**

2.1 Mineralogy: Classification of minerals.

2.2 Petrology: Igneous rocks: Origin, Structures, Classification - (Mode of occurrence, Silica percentage & Colour Index), Concordant and discordant intrusions, Civil Engineering significance. Secondary rocks: Formation, Classification, Structures, Grain size classification of sedimentary rocks. Civil Engineering significance. Metamorphic rocks: Agents and Types of Metamorphism, Structures.

### **Unit No.3 Structural Geology:**

**(05)**

3.1. Strike and Dip, Unconformity

3.2. Fold and Fault: Parameters, Classification, Causes, Civil Engineering significance.

3.3. Joint: Types of joint, drawing geological cross section from outcrop map and its Civil Engineering considerations.

## **SECTION II**

### **Unit No.4 Earthquake and Groundwater**

**(07)**

4.1 Terminology, Causes, Seismic waves, Seismograph, Seismogram, Scale, and its effects

4.2 Landslides: Types of Landslide, Causes, Prevention of Landslide

4.3 Groundwater: Sources of groundwater, Zones of groundwater, Types of Aquifer, Hydrological properties of aquifers.

### **Unit No.5 Geology of Dams and Reservoirs: (05)**

5.1. Suitable and Unsuitable geological conditions for locating a dam site, Type of a dam, Dams on carbonate rocks, sedimentary rocks, folded strata and Deccan traps,

5.2. Suitable and unsuitable geological conditions for reservoir site.

### **Unit No.6 Surface and Sub-surface Investigations:**

**(06)**

6.1. Building Stones: Engineering properties of rocks, Requirement of good building stone.

6.2. Geology of Tunnel and Bridge: Difficulties during tunnelling, Influence of geological conditions on tunnelling, Geological consideration while choosing tunnel alignment, Dependence of types of bridges on geological conditions.

**Practice Work:** Assignment on each unit.

### **Text Books and References:**

1. Engineering and General Geology – By Prabin Singh, S. K. Katariya and sons, Delhi.
2. Engineering and General Geology-By Dr. P. T. Sawant, New India Publishing Agency, New Delhi.
3. Principles of Engineering Geology and Geotechnics- By D. P. Krynine & W. R. Judd, CBS Publishers & Distributors, New Delhi.
4. Engineering Geology for Civil Engineering – By Dr. D. V. Reddy, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Engineering Geology - By B. S. Sathya Narayana Swami, Dhanpat Rai & Co. (P) Ltd, Delhi.
6. A Text Book of Engineering Geology – By R. B. Gupta, Pune Vidyarthi Griha Prakashan, Pune

7. Engineering Geology-By S. Ramamrutham, Dhanpat Rai Publishing company (P) Ltd. New Delhi.
8. Principles of Petrology – By G. W. Tyrrell, B.I. Publication Pvt. Ltd., New Delhi.
9. Principles of Physical Geology – By A. Holmes, ELBS Chapman & Hall, London.
10. Structural Geology – By M. P. Billings, Prentice Hall of India Private Ltd., New Delhi.
11. Experiments in Engineering Geology – By K. V. G. K. Gokhale & D. M. Rao, TMN, New Delhi.
12. Groundwater Hydrology- By Todd D. K., John Wiley & Son, New York.

**Guidelines Regarding Question Paper Setting:**

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

**End Semester Examination Paper Pattern**

Question No.	Based on Unit No.	Marks
1	1	12
2	2	12
3	3	11
4	4	12
5	5	12
6	6	11

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.TECH CIVIL SEMESTER VIII**  
**PROFESSIONAL ELECTIVE III: VALUATION OF REAL**  
**PROPERTIES (PCE-CV805)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL-III (PCE-CV805)	03	01	--	04	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: In Semester Evaluation   CIE: Continuous Internal Evaluation   ESE: End Semester Examination

**Course Objectives-**

1. To make the students to know about the cost approach to value.
2. To make the students understand the laws relating to immovable property
3. To make the students know about the purpose of valuation: fiscal and non-fiscal

**Course Outcomes-**

Upon completion of this course student will be able to

1. Students will be able to apply the cost approach to value.
2. Students will be able to understand the laws relating to immovable property.
3. Students will be able to carry out the depreciation.

## **SECTION-I**

**Unit: 1**

**(05)**

**Introduction:**

Cost, price and value; types of value; value elements – ingredients – characteristics – highest and best use – value in use – value in exchange. Annuities – capitalization – rate of capitalization– sinking fund – redemption of capital. Construction and use of valuation tables.

**Unit: 2**

**(07)**

**Income approach to value:**

Rent: Origin, classical theories and evolution of the concept. Types of rent – outgoings – income – yield – years' purchase. Lease: lessor and lessee: covenants, terms and conditions. Leasing; land and building; occupational lease. Valuation: lessor's interest, lessee's interest including sublease.

**Unit: 3****(06)****Market approach to value:**

Market – real estate market – market value; bell type curve (introduction).

**Depreciation:**

Age – effective age – economic life and remaining life - Depreciated replacement cost. Introduction to IOWA type survival curves.

**SECTION-II****Unit: 4****(07)****Cost approach to value:**

Advanced studies: land characteristics, belting theory, hypothetical plotting scheme, hypothetical building scheme, transfer of development rights, estimating cost of construction using building cost indices, replacement cost new, reproduction cost, reinstatement value.

**Market approach to value:**

Advanced studies: Market comparison techniques, adjustment grid model, regression analysis, automated sales analysis, residual technique, comparison by weight ages assigned to various factors to comparison.

**Unit-5****(07)****Various purposes of valuation: Fiscal:**

Stamp duty on transfer of property, Rating, Direct Tax Acts - Income Tax including capital gains, Wealth Tax, Court fees including probate and partition.

**Various purposes of valuation: Non-Fiscal:**

Bank Finance and securitization, Auction reserve, compulsory acquisition, Insurance, Sale / Purchase, Betterment levy, Standard / fair rent under rent law, various forms of obsolescence including depreciation.

**Unit- 6****(04)****Effects of legislation on Valuation:**

Valuation of agricultural lands by market approach & income approach. Elementary considerations in valuation of plantation, forest, orchards, queries, intangible assets like goodwill, royalty rights etc. Valuer's role, functions and responsibility. Code of ethics for valuers.

**Reference books:**

1. Theory and Practice of Valuation by Roshan H. Namavati
2. Valuation Relating to Standard Rent by Roshan H. Namavati
3. Valuation of Real Property by Shyamles Datta.
4. Law of Land Acquisition and Compensation by V.G. Ramachandran.
5. Parks' Valuation – 5<sup>th</sup> Edition (1998) by D.N. Banerjee – Eastern Law House, Calcutta

**Guidelines Regarding Question Paper Setting:**

1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No.5, 6, 7.

**End Semester Examination Paper Pattern**

<b>Question No.</b>	<b>Based on Unit No.</b>	<b>Marks</b>
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15
5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.TECH CIVIL SEMESTER VIII**  
**PROFESSIONAL ELECTIVE III: AIR POLLUTION AND CONTROL**  
**(PCE-CV805)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL-III (PCE-CV805)	03	01	--	04	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: InSemesterEvaluation CIE: ContinuousInternalEvaluation ESE: End SemesterExamination

**Course Objectives-**

Upon completion of this course you should be able to:

1. Describe current air pollution issues.
2. Know the main air pollutants and its effect on human health and environment.
3. Understand the regulations and policies to manage air pollution.
4. Have knowledge of technologies used to control and remove air pollutants.

**Course Outcomes-**

Student will be able to

1. Know the Scope of air pollution.
2. Design air pollution control devices.
3. Know the air pollution monitoring and regulatory control.

**SECTION-I**

**Unit: 1**

**(08)**

The structure of the atmosphere, Definition and Scope of Air Pollution, Sources of air pollution: Natural and artificial, quantity and composition of particulate & gaseous pollutant, Unit of measurements.

**Unit-2**

**(04)**

Effect of different air pollutants on living and non-living things. Preventive measures to overcome bad effects. Various air pollution Episodes.

**Unit- 3**

**(08)**

The meteorology and air pollution: Different Meteorological factors & thereeffect, lapse rate and stability of atmosphere, inversion phenomenon, various meteorological factors like



precipitation, humidity, temperature. wind patterns, direction, velocity and fluctuations, models of diffusion and dispersion plume behaviour.

## **SECTION-II**

### **Unit: 4**

**(06)**

Introduction to application of software for air quality. Air pollution monitoring and regulatory control, Ambient Air quality standards, emission limits, ambient air & stack sampling, equipment for ambient air and stack sampling, methods of sampling, pollution monitoring of existing sources and new installations.

### **Unit: 5**

**(06)**

Control of pollutant emission at source, alternative fuels, process change, removal methods for particulate, principles of particulate removals, various types of particulate control equipment, settling chamber, cyclone separators and scrubbers, fabric filters, electrostatic precipitators.

### **Unit: 6**

**(06)**

- a) Principles of removal of gaseous pollutants. Vehicular pollution, composition, quantity & control.
- b) Status of air pollution in India, air pollution control act and strategy for effective control of air pollution.

### **Text Books:**

- 1. Environmental engineering- By Peavy & Rowe.
- 2. Air Pollution- Wark and Warner
- 3. Martin Crawford, "Air Pollution and Control", Tata McGraw Hill Publication, 1st Edition, 1976.

### **Reference books:**

- 1. Air Pollution- Martin Crawford
- 2. Air Pollution and Industry – R.D. Ross
- 3. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
- 4. Environmental engineering- By Peavy & Rowe.
- 5. Rao M.N. and Rao H.V.N., Air Pollution Control, Tata-Mc Graw-Hill, New Delhi, 1996.

### **Guidelines Regarding Question Paper Setting:**

- 1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
- 2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No. 5, 6, 7.

## **End Semester Examination Paper Pattern**

<b>Question No.</b>	<b>Based on Unit No.</b>	<b>Marks</b>
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15

5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**FINAL YEAR B.TECH CIVIL SEMESTER VIII**  
**PROFESSIONAL ELECTIVE III: CONSTRUCTION PRACTICES**  
**(PCE-CV805)**

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL-III (PCE-CV805)	03	01	--	04	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: InSemesterEvaluation CIE: ContinuousInternalEvaluation ESE: End SemesterExamination

**Course Objectives-**

1. To study various earth moving equipment's.
2. To understand RMC and Hot Mix process.
3. To study pre fabrication technique.
4. To study various construction techniques like Slip form, Grouting, Blasting.

**Course Outcomes**

After successful completion of the course, the students will be able to.-

1. Know the earth moving equipments& excavation in hard rock.
2. Understand new construction methods & techniques.
3. Know the concreting equipments, plants & concreting methods.
4. Understand plants & equipments used for steel construction & road construction.
5. Understand construction of heavy structure & construction management.

**SECTION – I**

**Unit No.1**

**(06)**

- a) Earth moving equipments- Tractors, bulldozers, scrapers, power shovel, hoes, drag line, clamshell, trenchers, compactors
- b) Cycle time and production rates (simple numerical problems ), types and performance, operating efficiencies, lifting capacities.

**Unit No.2****(06)**

- a) Excavation in hard rock- Rippers, jack hammers, drills, compressors and pneumatic equipments.
- b) Blasting explosives, detonators, fuses,
- c) Drainage in excavation- necessity and methods of dewatering

**Unit No.3****(06)**

- a) RMC plant, layout and production capacity
- b) Grouting, shotcreting, under water concreting
- c) Slip formwork

**SECTION – II****Unit No.4****(06)**

- a) Prefabricated construction, comparison with monolithic construction
- b) Steel construction- planning and field operation, erection equipments
- c) Floating and dredging equipments

**Unit No.5****(06)**

- a) Asphalt mixing and batching plant hot mix plant, sensor pavers for rigid roads, crushing plants.
- b) Belt conveyors, cable ways – need and construction methods.
- c) Diaphragm walls- purpose and construction methods.

**Unit No.6****(06)**

- a) New projects- conceptual planning, site access and services, advantages of mechanization in construction
- b) Introduction to trenchless technology and need
- c) Safety measures in construction, prevention of accidents, introduction to disaster management.

**Reference books :-**

1. Construction Planning equipment & methods – R. L. Puerifoy, Mc Graw Hill Book
2. Construction equipment – Mahesh Verma.
3. Handbook of Heavy Construction – Stubb.
4. Heavy Construction – Planning, Equipment, Methods- Jagman Singh
5. Erection of steel structures – Thomas Baron
6. Reinforced concrete bridges – Taylor

**Guidelines Regarding Question Paper Setting:**

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70marks.

## End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1	1	12
2	2	12
3	3	11
4	4	12
5	5	12
6	6	11

### SHIVAJI UNIVERSITY, KOLHAPUR FINAL YEAR B.TECH CIVIL SEMESTER VIII PROFESSIONAL ELECTIVE III: WATER POWER ENGINEERING (PCE-CV805)

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EL-III (PCE-CV805)	03	01	--	04	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: InSemesterEvaluation CIE: ContinuousInternalEvaluation ESE: End SemesterExamination

#### Course Objective:

1. To study fundamental knowledge of sources of energy, estimation of hydro power available, types of hydro power plants and water conveyance systems.
2. To study types and classifications of different components of hydro power plants and general arrangements of power stations.
3. To know basic components, functions and types of turbines, choice of turbines, turbine setting and cavitation
4. To understand the concepts of hydraulic design and economic diameter of pipe, pumped storage power plants and tidal power plants with their basics and general descriptions.

**Course Outcomes:**After successful completion of the course, the students will be able to,

1. Explain the basics of sources of energy, types of hydro power plants, water conveyance systems and general arrangements of power plants.
2. Illustrate the types, classifications and functions of different components of hydro power plants.
3. Identify the hydro power available, hydraulic design and economic diameter of pipe.
4. Analyze the basic components and working of turbines, pumped storage power plants and tidal power plants with their basics and general descriptions.

## **SECTION-I**

### **UNIT 1: (06)**

- A. Introduction: Sources of energy, types of power station, types of hydro power schemes, Estimation of hydro power available, gross head, net head, storage and pondage, hydrographs, mass curves, flow duration curves.
- B. Nature of Demand: Load curve, load duration curves, load factor, plant capacity factor, plant use factor, firm power, secondary power.

### **UNIT 2: (06)**

- A. Intake: Types, hydraulics of intake, trash rack, transition from gate to conduit, intake gates.
- B. Surge Tank: Functions and behavior of the surge tanks, location, types of surge tanks, basic design criteria of simple surge tank, forebay.

### **UNIT 3: (06)**

- A. Water Conveyance Systems: Power canals – Hydraulic design.
- B. Penstock: Types, hydraulic design and economic diameter pipe, supports, anchor blocks.
- C. Tunnels: Classification, location and hydraulic design, tunnel linings.

## **SECTION-II**

### **UNIT 4: (06)**

- A. Power Station: General arrangements of power station, power house, sub-structure and super structure, main dimensions.
- B. Underground Power Station: Necessity, types, development and economics, advantages and disadvantages.

### **UNIT 5: (06)**

- A. Turbines: Classification of turbines, characteristics of different types, choice of type of turbine, turbine setting and cavitation, tail race, draft tubes, function and types, hydraulic design.

### **UNIT 6: (06)**

- A. Pumped Storage Plants: Purpose and general layout of pumped storage schemes, types, economics of pumped storage plants.
- B. Tidal Power Stations: Classification, general description of different types, depression power plants.

### **TEXTBOOKS AND REFERENCES:**

1. Water Power Development – E. Mosoni, Vol. I & II.
2. Hydro-electric Engineering Practice – G. Brown, Vol. I, II & III.
3. Hydro – Electric Hand Book – Creager and Justin.
4. Hydro Power Structures – Varshney.
5. Water Power Engineering – M. M. Dandekar, Vikas Pub. House Pvt. Ltd.
6. Water Power Engineering – P. K. Bhattacharya, Khanna Pub., Delhi.
7. Water Power Engineering – M. M. Deshmukh, Dhanpat Rai and Sons.

### **Guidelines Regarding Question Paper Setting:**

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.

3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70marks.

### End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1	1	12
2	2	12
3	3	11
4	4	12
5	5	12
6	6	11

## SHIVAJI UNIVERSITY, KOLHAPUR FINAL YEAR B.Tech CIVIL SEMESTER VIII STRUCTURAL DESIGN AND DRAWING-II

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Total credit	Scheme	Theory (Marks)		Practical (Marks)	
SDD-I (PCC-CV806)	-	-	4	2		Max	Min for Passing	Max	Min for Passing
					ISE	--	--	50	20
					CIE	-	-	--	--
					ESE	-	-	25	10

ISE – In Semester Evaluation   CIE – Continuous Internal Evaluation   ESE – End Semester Evaluation

### Course Objectives:

- 1.To apply holistic approach of planning, analysis, segmentation & design of RCC building.
- 2.To understand the knowledge of how to use the codal provision in I.S.456-2000, S.P.16 for design
- 3.To understand the reinforcement detailing of various structures as per codal provision S.P.34
- 4.To get an exposure to the method of analysis & design using software.

### Course Outcomes:

After successful completion of course student will be able to

- 1.Translate the ideas into workable plans
- 2.Classify the components
- 3.Design the units & hence the structure as a whole
- 4.Draft the details for execution
- 5.To read and understand the supplied drawing for execution on site.

Term work shall consist of detailed design & drawing of the following R.C.

structures by Limit State Method.

1. Residential two storied building. (Minimum 60 sqmt. per floor). Drawings prepared shall indicate ductility details as per the provision in IS:13920. (This Project should be in a group of 4-6 students)

2. Any ONE from the following: (Individual Student should perform this project)

a) Retaining wall (cantilever or counter fort type)

b) Design of footing (Raft foundation / pile foundation)

3. Analysis and design of RCC framed structure using software.

**Note:** At least one site visit to be conducted to show the onsite detailing.

## SHIVAJI UNIVERSITY, KOLHAPUR

### FINAL YEAR B.Tech CIVIL SEMESTER VIII

### PROJECT PHASE - II

Course	Teaching Scheme					Evaluation Scheme			
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for Passing	Max.	Min. for Passing
PP-II (PW- CV807)	--	--	02	01	ISE	---	---	50	20
					CIE	---	---	---	---
					ESE	---	---	100	40

ISE: In Semester Evaluation   CIE: Continuous Internal Evaluation   ESE: End Semester Examination

The project work started in the seventh semester will continue in this semester. The students will complete the project work in this semester and present it before the assessing committee.

The term work assessment committee as constituted in the seventh semester will assess the various projects for the relative grading and group average. The guides will award the marks for the individual students depending on the group average. Each group will submit the copies of the completed project report signed by the guide to the department. The head of the department will certify the copies and return them to the students. One copy will be kept in the departmental library.

For work load calculation minimum load is 2 Hr./week, for one group of FIVE students. (As per AICTE Guide Lines)

#### Probable Activities of Project Phase – II

1. Progress presentation I
2. Progress presentation II
3. Final presentations in front of DRC along with submission of spiral bound copy
4. Checking of project format on spiral bound by DRC

5. Submission of final bound copy along with published paper