

**For Batch 2016-17 Onwards  
SCHEME OF EXAMINATION**

**And**

**SYLLABI**

**for**

**BACHELOR OF VOCATION**

**In**

**(CONSTRUCTION TECHNOLOGY)**

**5<sup>th</sup> SEMESTER & 6<sup>th</sup> SEMESTER**

**Offered by**

**University School of Information, Communication & Technology**



**GURU GOBIND SINGH  
INDRAPRASTHA  
UNIVERSITY**

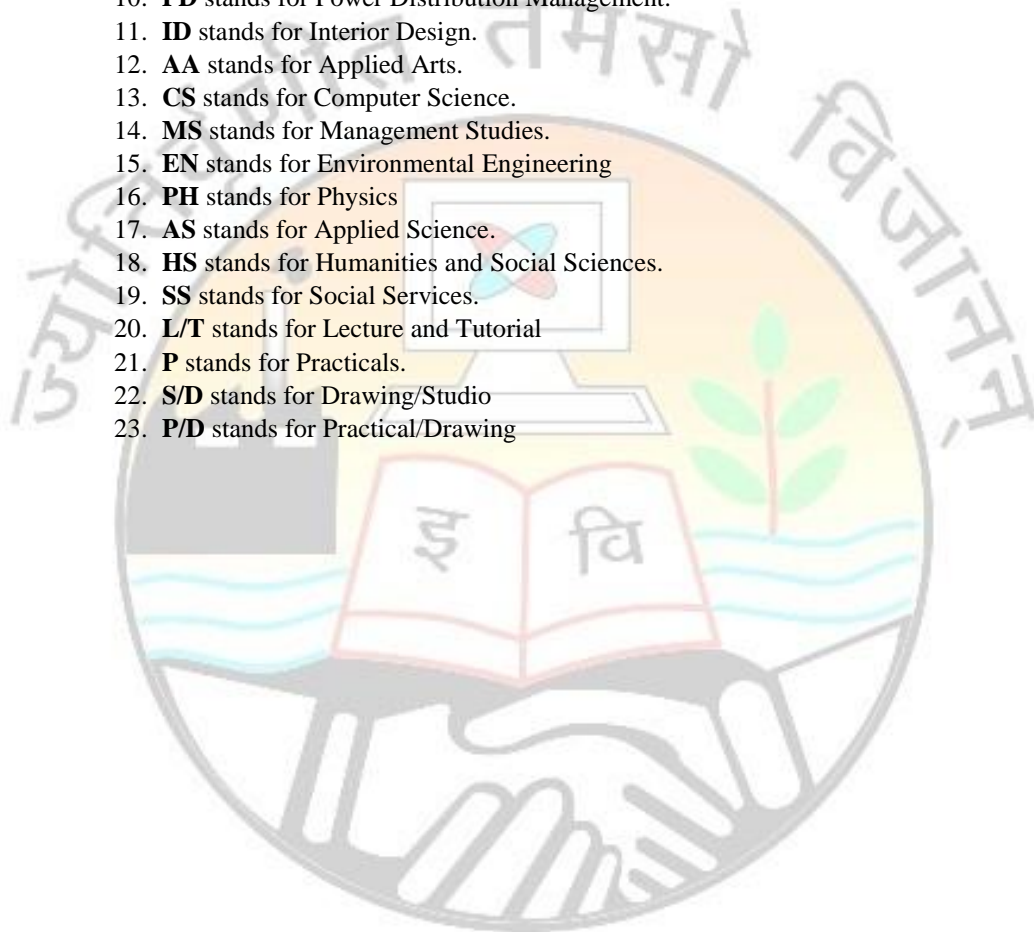
**GURU GOBIND SINGH  
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**Guru Gobind Singh Indraprastha University  
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**NOMENCLATURE OF CODES GIVEN IN THE SCHEME OF B.VOC**

1. **ET** stands for Engineering and Technology.
2. **V** stands for Vocation.
3. **MC** stands for Mobile Communication.
4. **SD** stands for Software Development.
5. **AE** stands for Automobile.
6. **CE** stands for Consumer Electronics.
7. **PT** stands for Printing Technology.
8. **CT** stands for Construction Technology.
9. **RA** stands for Refrigeration & Air-Conditioning.
10. **PD** stands for Power Distribution Management.
11. **ID** stands for Interior Design.
12. **AA** stands for Applied Arts.
13. **CS** stands for Computer Science.
14. **MS** stands for Management Studies.
15. **EN** stands for Environmental Engineering
16. **PH** stands for Physics
17. **AS** stands for Applied Science.
18. **HS** stands for Humanities and Social Sciences.
19. **SS** stands for Social Services.
20. **L/T** stands for Lecture and Tutorial
21. **P** stands for Practicals.
22. **S/D** stands for Drawing/Studio
23. **P/D** stands for Practical/Drawing



**GURU GOBIND SINGH  
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**BACHELOR OF VOCATION  
CONSTRUCTION TECHNOLOGY  
FIFTH SEMESTER EXAMINATION  
(LEVEL-VII)**

Paper Code	Paper ID	Paper	L	T/P	Credits
<b>THEORY PAPERS</b>					
ETVHS-701		Technical English(Common to all disciplines)	3	0	3
ETVCT-701		Steel Design	3	0	3
<b>CORE ELECTIVE-II (Select any one)</b>					
ETVCT-703		Foundation Engineering	3	0	3
ETVCT-705		Advanced Surveying	3	0	3
<b>CORE ELECTIVE-III (Select any one)</b>					
ETVCT-707		Waste Water Engineering	3	0	3
ETVCT-709		Advanced Structural Analysis	3	0	3
<b>GENERAL ELECTIVE-II (Select any one)*</b>					
ETVSS-751		NCC	0	2	1
ETVSS-753		NSS	0	2	1
ETVSS-755		Sports	0	2	1
ETVSS-757		Community Services	0	2	1
ETVSS-759		ECO Club	0	2	1
ETVSS-761		YOGA	0	2	1
<b>PRACTICAL/VIVA VOCE (Select any one Lab based on CORE ELECTIVE-II)</b>					
ETVCT-753		Foundation Engineering Lab	0	4	4
ETVCT-755		Advanced Surveying Lab	0	4	4
<b>PRACTICAL/VIVA VOCE</b>					
ETVHS-751		Language Lab(Common to all disciplines)	0	3	3
ETVCT-751		Software Training in Civil Engineering	0	3	3
ETVCT-757		Minor Project	0	8	4
ETVCT-759		Industrial Training-IV	0	2	4
ETVCT-761		Seminar	0	4	2
			<b>12</b>	<b>26</b>	<b>33</b>

**NOTE:**

There are five industrial trainings to be carried out by the student(s) in B.Voc course. Industrial Trainings I, III and V will be with weightage of two credits each. These trainings are to be carried out during winter vacations for the duration of two weeks. Industrial Trainings II and IV will be with weightage of four credits each. These trainings are to be carried out during summer vacations for the duration of four to six weeks. These training may be done from industry/Skill Knowledge Providers (SKPs) /Sector Skill Councils (SSCs) / Training Centers/Institutes. Student should submit training report during evaluation. Industrial Training done at the end of the semester will be evaluated in the subsequent semesters.

\*Non University Examination System (NUES)

**BACHELOR OF VOCATION  
CONSTRUCTION TECHNOLOGY  
SIXTH SEMESTER EXAMINATION  
(LEVEL-VII)**

Paper Code	Paper ID	Paper	L	T/P	Credits
<b>THEORY PAPERS</b>					
ETVCT-702		Construction Management	3	0	3
<b>CORE ELECTIVE-IV (Select any one)</b>					
ETVCT-704		Railway, Bridges, Airport and Tunnel Engineering	3	0	3
ETVCT-706		Repair and Rehabilitation of Structures	3	0	3
<b>CORE ELECTIVE-V (Select any one)</b>					
ETVCT-708		Water Resources Engineering	3	1	4
ETVCT-710		Pre-Stressed Concrete	3	1	4
<b>PRACTICAL/VIVA VOCE</b>					
ETVCT-752		Construction Management Study	0	3	3
ETVCT-754		MATLAB/Open Source Software Training (Such as R-Package)	0	3	3
ETVCT-756		Industrial Training-V	0	2	4
ETVCT-758		Major Project#*	0	24	12
<b>TOTAL</b>			<b>09</b>	<b>33</b>	<b>32</b>

**NOTE:**

There are five industrial trainings to be carried out by the student(s) in B.Voc course. Industrial Trainings I, III and V will be with weightage of two credits each. These trainings are to be carried out during winter vacations for the duration of two weeks. Industrial Trainings II and IV will be with weightage of four credits each. These trainings are to be carried out during summer vacations for the duration of four to six weeks. These training may be done from industry/Skill Knowledge Providers (SKPs) /Sector Skill Councils (SSCs) / Training Centers/ Institutes. Student should submit training report during evaluation. Industrial Training done at the end of the semester will be evaluated in the subsequent semesters.

#\*The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to major project should be delivered one month after starting of Semester. The progress will be monitored through seminars and progress reports. ***The students may be allowed to do Industrial Major Project on-site during 5 days in a week and class work should be completed in 2 working days in the respective institution.***

**For Award of Diploma:**

1. The total number of the credits of the Diploma (Construction Technology) Programme = 64.
2. Student shall be required to appear in examinations of all courses. However, to award the Diploma (Construction Technology) a student shall be required to earn a minimum of 60 credits

**For Award of Advanced Diploma:**

1. The total number of the credits of the Advanced Diploma (Construction Technology) Programme = 127.
2. Student shall be required to appear in examinations of all courses. However, to award the Advanced Diploma (Construction Technology) a student shall be required to earn a minimum of 120 credits.

**For Award of B.Voc Degree:**

1. The total number of the credits of the B.Voc. (Construction Technology) Programme = 192.
2. Student shall be required to appear in examinations of all courses. However, to award the B.Voc. (Construction Technology) degree, a student shall be required to earn a minimum of 180 credits.



**TECHNICAL ENGLISH**  
**(Common to all Disciplines)**

**Paper Code: ETVHS-701**  
**Paper: Technical English**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**INSTRUCTIONS TO PAPER SETTER:**

**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

**Objectives:**

- To equip students to recognize, explain, and use the rhetorical strategies and the formal elements of specific genres of technical communication, such as technical abstracts, data based research reports, instructional manuals, technical descriptions etc.
- To help students understand the process of collection, analysis, documentation, and reporting of research clearly, concisely, logically, and ethically and understand the standards for legitimate interpretations of research data within scientific and technical communities.
- To initiate students into critical and creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information towards meaningful and effective communication
- To help students understand ethical considerations in technical and professional writing, realizing the consequences of various communication acts.

**Learning Outcomes:** Upon successful completion of the course the student shall be able to:

- Understand and demonstrate composing processes through invention, organization, drafting, revision, editing, and presentation as evidenced in satisfactory completion of all the written, visual, web-based, and oral discourses to be submitted in this course.
- To recognize and use the rhetorical and stylistic elements necessary for the successful practice of scientific and technical communication;
- Create various products most frequently used in scientific and technical communication.
- Develop ethical problem-solving communication skills in professional situations.

**UNIT-I**

Technical Writing: Definition, Purpose and Characteristics of Technical Writing.

Technical Writing Skills: Methods and means of the Pre-writing stage, the Writing Stage and the Post-writing Stage.

[T1, T2][No. of Hrs. 12]

**UNIT-II**

Formal Formatting: Arrangement of Formal Elements, Front Material, Format Devices in the Body of Formal Report-Heading, Pagination, End Material – Citations, References and Bibliography, Appendix.

[T1, T2][No. of Hrs. 10]

**UNIT-III**

Writing and Designing for Electronic Media: Use of Internet as a Writing tool; designing and writing for multimedia applications and the World Wide Web.

[T1, T2][No. of Hrs. 12]

**UNIT-IV**

Research and Writing Ethics: Explaining Forms and Consequences of Plagiarism, Introduction to Intellectual Property Right and Copy Right Laws.

[T1, T2][No. of Hrs. 11]

**Text Book(s):**

[T1] Sides, Charles H., "How to Write and Present Technical Information", Cambridge Univ. Press, 1999.

[T2] Basu, B. N., "Technical Writing", PHI Learning Pvt. Ltd., 2007.

**Reference Book(s):**

[R1] Beer, David F. and David A. McMurrey, "A Guide to Writing as an Engineer", New York: Wiley, 2005.

[R2] Gibaldi, Joseph, and Walter S. Achtert, "MLA Handbook for Writers of Research Papers, Thesis, and Dissertations", Modern Language Association, 1980.

[R3] Rubens, Philip, "Science and Technical Writing: A Manual of Style", Routledge, 2002.

[R4] Anderson, Marilyn, Pramod K. Nayar, and Madhuchandra Sen, "Critical Thinking, Academic Writing and Presentation Skills", Pearson. 2010.

The Scheme and Syllabus for B.Voc (Construction Technology) (3rd Year) has been approved in 45th BOS Meeting of USICT held on 16th March, 2017 and 43<sup>rd</sup> Academic Council Meeting held on 25<sup>th</sup> May, 2017. The Scheme and Syllabus is applicable for the batch admitted in the Academic Session 2016-17 onwards, w.e.f., 1<sup>st</sup> August, 2018.

**STEEL DESIGN**

**Paper Code: ETVCT-701**  
**Paper: Steel Design**

L	T/P	C
3	0	3

**INSTRUCTIONS TO PAPER SETTERS:****MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

**Objective & Pre-requisite:** Having the basic knowledge of building construction, construction materials will enhance the understanding capacity of this subject. The basic objective of this subject is to study various concepts of steel design in construction and civil engineering perspective. To study and understand structural steel sections and connections including welded connections to learn about tension and compression members. To study beams and trusses.

**Learning Outcomes:** Better visualization of structural steel sections. To have basic understanding of use of steels in civil engineering. Ability to design simple bolted and welded connections, tension and compression members, beams.

**UNIT-I****Structural Steel Sections and connections:**

Types of steel sections, Merits and demerits of steel structures, Designation of structural steel sections as per IS handbook and IS:800, Riveted connections, types of joints (Lap and Butt joints), Bolted connections, Design of riveted and bolted joints. Failures of joints, Assumptions in design of joints.

**Welded connections:**

Types of welds, permissible stresses in welds types of welded connections, design of butt and fillet welded connections with gusset plate subjected to axial loads, testing and inspection of welded joints as per IS:800.

[T1, T2][No. of Hrs.: 12]

**UNIT-II****Tension Members:**

Permissible stresses in tension for steel, Design of tension members as per IS:800 (flats, angles and tee sections only).

**Compression Members:**

Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in comparison as per IS:800, Strength of columns of single angle, double angle and built up sections, Design of single angle, double angle (struts) for axially loaded columns (no built up columns design), use of tacking rivets, Sketches of Slab base, Column base and Gusseted base (no design).

[T1, T2][No. of Hrs.: 11]

**UNIT-III****Beams:**

IS specifications for the design of simply supported steel beams including design of baseplate at the ends (laterally) restrained beams only), structural behaviour deflected shapes and function of various elements of plate girder and freehand sketching of a plate girder and its elements. Beam and column, framed and seated connections (descriptive only, no design).

[T1, T2][No. of Hrs.: 11]

**UNIT-IV**

Types of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept)

Drawings of king post, queen post and fink roof trusses with details of joints, fixing details of purlins and roof sheets.

[T1, T2][No. of Hrs.: 11]

**Important Note:**

Use of IS: 800 – 2007 and Steel Tables are permitted in examination.

**NOTE:**

Field visits may be organized to construction site to explain steel design aspects practically. Guest lectures by field engineers/ consultants/ experts may be organized in the institute for the benefit of students.

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**Text Book(s):**

- [T1] N. KrishnaRaju, "Structural Design and Drawing", University Press, Hyderabad  
[T2] Ramachandra, "Design of Steel Structures", Vol.-1, Universities Press. Hyderabad

**Reference Book(s):**

- [R1] Subramanyam. N, "Steel Structures", Oxford Higher Education, New Delhi  
[R2] S.K. Duggal, "Limit State Design of Steel Structures", Tata Mc Graw Hill, New Delhi.  
[R3] Bhavikatti, "Design of Steel Structures" I. K. International Pvt Ltd, 2009





**FOUNDATION ENGINEERING**  
**(Core Elective-II)**

**Paper Code: ETVCT-703**  
**Paper: Foundation Engineering**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**INSTRUCTIONS TO PAPER SETTERS:**

**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

***Objective & Pre-requisite:** To help students understand analyzing the bearing capacity of soils, to design shallow and deep foundations, to estimate the settlements, to design the rigid and flexible retaining structures and to design cuts and excavations. Students will learn various sub surface exploration techniques and methods of ground improvement.*

***Learning Outcomes:** Ability to understand the concepts of soil exploration in the field and analyze the concepts of Bearing capacity and correlate them in the field. Better understanding of shallow and deep foundations. Ability to apply the concepts of earth pressure, stability of slopes and soil improvement techniques in real life.*

**UNIT-I**

**Sub surface exploration:** Types of soil and rock sample, Indirect, direct and semi-direct methods of sub surface exploration; Routine field tests, Location, spacing and depth of borings.

**Bearing capacity of soils:** Bearing capacity criteria and factors affecting it, Modes of shear failure, Theories of Bearing capacity, Foundation Pressures, Permissible settlements, Allowable bearing pressure, Field tests to estimate bearing capacity

**Shallow foundations:** Types of shallow foundations, selection of type of foundation, location and depth of foundation, causes of settlement, settlement analysis, Design of shallow foundations, design of combined footings, Mat foundations.

[T1, T2][No. of Hrs.: 12]

**UNIT-II**

**Deep foundations :** Classification of Piles, Pile driving equipment, calculation of bearing capacity of a single pile, Under-reamed piles, Pile groups, Uplift and Lateral resistance of piles, Inclined loading of piles, pile cap.

**Drilled Piers:** Types and uses, bearing capacity, settlement, construction procedures

[T1, T2][No. of Hrs.: 11]

**UNIT-III**

**Lateral Earth Pressure:** Limit analysis and Limit Equilibrium methods, Earth pressure at rest, Rankine's states of Plastic equilibrium, Earth pressure theories, Graphical methods to determine magnitude and location of resultant earth pressure

**Earth retaining structures:** Gravity type retaining walls: Proportioning retaining walls, stability requirements, backfill materials and drainage; Joints in retaining walls; Cantilever and Anchored sheet pile walls

[T1, T2][No. of Hrs: 11]

**UNIT-IV**

**Stability of slopes:** Short and long term failures, causes of failure, Types of landslides and slope movements, factor of safety, Concept of slope stability analysis, Infinite and finite slopes and their analysis, Selection of shear strength parameters, slope protection measures.

**Soil improvement techniques:** Compaction, Drainage and vibration methods, Precompression and consolidation, grouting and injection; Chemical stabilization, Geomembranes and geotextiles.

[T1, T2][No. of Hrs: 11]

**NOTE:**

*Field visits may be organized to construction site to explain the various aspects of foundation engineering. Guest lectures by field engineers/ consultants/ experts may be organized in the institute for the benefit of students.*

**Text Book(s):**

- [T1] R. B. Peck and Terzaghi, "Soil Mechanics in Engineering Practice", John Wiley  
[T2] V.N.S. Murthy, "Soil Mechanics and Foundation Engineering", CBS

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**References Book(s):**

- [R1] Shashi K. Gulati and Manoj Datta, "Geotechnical Engineering", Tata McGraw Hill 2008  
[R2] Donald P. Coduto, "Geotechnical Engineering", Prentice-Hall India.  
[R3] J. E. Bowles, "Foundation Analysis and Design", Mc-Graw Hill  
[R4] N.P. Kurian, "Design of foundation Systems, Principles and Practices" Narosa Publisher



**ADVANCED SURVEYING**  
**(Core Elective-II)**

**Paper Code: ETVCT-705**  
**Paper: Advanced Surveying**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**INSTRUCTIONS TO PAPER SETTERS:**

**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

**Objective & Pre-requisite:** The pre-requisites of this subject are Surveying I and Surveying II. The objectives of this subject are to understand the surveying in totality from modern surveying equipment point of view. To understand the concepts of surveying, geodetic surveying and engineering surveys. To understand the concepts behind modern surveying equipment and their utility in the field. To learn about modern surveying methods such as remote sensing, satellite based positioning systems, aerial surveying and GIS

**Learning Outcomes:** Enhanced ability of understanding of different types of surveying able to operate modern surveying equipment independently. Able to use EDM, Digital Theodolite and Total station in the field. Improved familiarity with GIS.

**UNIT-I**

**Introduction:** Review of classification of surveys

**Geodetic Surveying-** Introduction, Basic concepts of Triangulation, systems, orders and trilateration

**Engineering Surveys:** Engineering and project surveys, Route surveys, Longitudinal and cross-section levelling, Topographic surveys, City surveys and Underground surveys

[T1, T2, T3][No. of Hrs.: 11]

**UNIT-II**

**Modern Surveying Equipment**

Introduction, concepts and application of Modern Surveying equipment and techniques such as:

- a) EDM
- b) Electronic/ Digital Theodolite
- c) Digital Planimeter
- d) Total station

[T1, T2, T3][No. of Hrs.: 11]

**UNIT-III**

**Modern methods of surveying:**

**Remote sensing-** Concepts and foundations of remote sensing- Introduction, Energy sources and radiation principles, Electromagnetic spectrum, use of systems of remote sensing, Resolution in remote sensing, ideal remote sensing systems, characteristics of real remote sensing systems, Remote sensing in India, Problems confronting remote sensing systems, Applications of remote sensing

**Satellite based positioning systems-** Concept, types, Applications in surveying.

[T1, T2, T3][No. of Hrs.: 11]

**UNIT-IV**

**Aerial surveying-** Introduction, advantages of aerial photogrammetry, Basic terminology, Equipment, Procedure of Aerial Surveying, Introduction to general features of Photographic images, Application of Aerial surveying

**Geo Graphical Information Systems-** Introduction and concept of – GIS, systems & Information systems, Evolution of GIS, Components of GIS- Data, Technology, Application & People. Remote sensing and GIS Integration, Applications of GIS, GIS- issues, prospects & Internet resources

[T1, T2, T3][No. of Hrs.: 12]

**NOTE:**

*Field visit may be organized to construction site for better understanding of advanced surveying aspects in complimentary with lab work. Guest lectures by field engineers/ consultants/ experts may be organized in the institute for the benefit of students.*

**Text Book(s):**

[T1] B.C. Purnimia-II/III, "Surveying", Laxmi Publication

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- [T2] R. Subramanian, “Surveying and Levelling”, Oxford Higher Education  
 [T3] Duggal, “Surveying”, Vol.2, McGraw Hill Education (I) Pvt. Ltd.

**Reference Books:**

- [R1] A.M. Chandra, “Higher Surveying”, New Age Publication  
 [R2] Dr. K.R. Arora, “Surveying”, Vol. II, Standard Book House, New Delhi  
 [R3] Gopi, “Advanced Surveying: Total Station, GIS and Remote Sensing”, Pearson Education  
 [R4] Saikai et al, “Surveying”, PHI Publications  
 [R5] Bannister, Raymond and Baker, “Surveying”, Pearson Education  
 [R6] Thomas, W. Norman, “Higher Surveying”, Published by Arnold, London, 1920  
 [R7] Thomas M Lillesand, “Remote Sensing and Image Interpretation”, Wiley India Edition  
 [R8] C. P. Lo, Albert K. W. Yeung, “Concepts and Techniques of Geographic Information Systems”, Eastern Economic Edition



GURU GOBIND SINGH  
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**WASTE WATER ENGINEERING**  
**(Core Elective-III)**

**Paper Code: ETVCT-707**  
**Paper: Waste Water Engineering**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**INSTRUCTIONS TO PAPER SETTERS:**

**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

*Objective & Pre-requisite: Pre requisite of this subject is Water Engineering. To study about waste water treatment and disposal, sewerage systems, BOD, COD, sewage treatment,*

*Learning Outcomes: Able to understand nuances of waste water engineering.*

**UNIT-I**

Introduction to waste water treatment and disposal, Purpose of sanitation, Necessity of systematic collection and disposal of waste water, Definitions of terms used in waste water/sanitary engineering, Collection and conveyance of sewage, Conservancy and water carriage systems, their advantages and Disadvantages. Surface drains: various types, suitability, Types of sewage: Domestic, industrial, storm water and its seasonal variation, Types of sewerage systems, Appurtenances: Location, function and construction features of. Manholes, drop manholes, catch basin, inverted siphon, flushing tanks, grease and oil traps, storm regulators, ventilating shafts.

[T1, T2][No. of Hrs.: 12]

**UNIT-II**

Laying and Construction of Sewers, Setting out/alignment of sewers, Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes. Different types of sewer joints, sewer materials used with neat sketches. Construction of surface drains and different sections of drains used. Sewage characteristics, Properties of sewage and IS standards for analysis of sewage, Physical, chemical and bacteriological parameters. Dissolved Oxygen, B.O.D. C.O.D etc.

[T1, T2][No. of Hrs.: 11]

**UNIT-III**

Sewage Treatment, Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams, Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plain sedimentation tanks, primary clarifiers, secondary clarifiers, filters, control beds, intermittent sand filters, trickling filters, sludge treatment and disposal, oxidation ponds, oxidation ditch etc.

[T1, T2][No. of Hrs.: 11]

**UNIT-IV**

Natural Methods of Sewerage Disposal, General composition of sewage and disposal methods, Disposal by dilution, sewage farming, Self-purification of stream, Disposal by land treatment, Nuisance due to disposal Building Drainage, Aims of building drainage and its requirements, one pipe and two pipe systems of plumbing, Different types of sanitary fittings and installations, Traps, seals, causes of breaking seals. Construction, working principle and design of Septic tank, soak pit, Cess pools, Imhoff tank.

[T1, T2][No. of Hrs.: 11]

**NOTE:**

*Field visits may be organized to construction site to explain the various aspects of waste water engineering. Guest lectures by field engineers/ consultants/ experts may be organized in the institute for the benefit of students.*

**Text Book(s):**

- [T1] Metcalf and Eddy Inc: "Waste Water Engineering", Tata Mc. Graw Hill, New Delhi  
[T2] Peavy, Rowe & Tchobanoglous, "Environmental Engineering", Mc. Graw Hill, New Delhi.

**References Book(s):**

- [R1] G.L. Karia and R.A. Christian, "Wastewater Treatment Concept and Design Approach", PHI Publication  
[R2] Qasim, S. "Water Works Engineering", Prentice Hall Publication, New Delhi.

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- [R3] “Manual on Sewerage & Sewage Treatment”, C. P. H. E. E. O., Ministry of Urban Development (MoUD), GOI, New Delhi
- [R4] Fair & Geyer, “Water Supply and Waste Water Disposal”.
- [R5] Parker, “Waste Water System Engineering”, PHI
- [R6] S. K. Garg, “Wastewater Engineering”, Khanna publication
- [R7] M. N. Rao & A. K. Dutta, “Wastewater Treatment”, PHI, Publication
- [R8] “Standard Methods for the Examination of Water and Wastewater”, A.P.H.A., New York



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**ADVANCED STRUCTURAL ANALYSIS**  
(Core Elective-III)

**Paper Code: ETVCT-709**

**Paper: Advanced Structural Analysis**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**INSTRUCTIONS TO PAPER SETTERS:**

**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

**Objective & Pre-requisite:** The pre-requisite for this subject are to study structural mechanics and structural analysis. The prime objective is to study Slope Deflection method, Moment Distribution Method, Kani's Method, Stiffness Matrix Method and Flexibility Matrix Method.

**Learning Outcomes:** Ability to apply Slope Deflection method, Moment Distribution Method, Kani's Method, Stiffness Matrix Method and Flexibility Matrix Method in structural analysis

**UNIT-I**

Slope Deflection method: analysis of continuous beams, analysis of rigid frames, frames with sloping legs, gabled frames, frames without sway and with sway, settlement effects.

[T1, T2, T3, T4][No. of Hrs.: 11]

**UNIT-II**

Moment Distribution Method: Analysis of beams and frames.

[T1, T2, T3, T4][No. of Hrs.: 11]

**UNIT-III**

Kani's Method: Analysis of beams and frames.

[T1, T2, T3, T4][No. of Hrs.: 11]

**UNIT-IV**

**Stiffness method:** Development of stiffness matrices by physical approach, stiffness matrices for truss and frame elements, displacement transformation matrix, development of total stiffness matrix, analysis of simple structures, plane truss and plane frame, nodal loads and element loads, lack of fit and temperature effects.

**Flexibility method:** Development of flexibility matrices by physical approach, Flexibility matrices for truss and frame elements, load transformation matrix, development of total flexibility matrix of the structure, analysis of simple structures, plane truss and plane frame, nodal loads and element loads, lack of fit and temperature effects.

[T1, T2, T3, T4][No. of Hrs.: 12]

**NOTE:**

Guest lectures by field engineers/ consultants/ experts may be organized in the institute for the benefit of students.

**Text Books:**

- [T1] G.S. Pandit, "Structural Analysis", CBS Publication.  
 [T2] Bhavikatti, "Structural Analysis (Vol. I and II)", Vikas Publication  
 [T3] S. Rajasekaran, "Computational Structural Mechanics", Prentice-Hall India.  
 [T4] Pandit and Gupta, "Structural Analysis a Matrix Approach" Tata McGraw Hill

**References Books:**

- [R1] C.S. Reddy, "Basic Structural Analysis", Tata McGraw Hill  
 [R2] R.C. Hibbler, "Structural Analysis", Pearson Education  
 [R3] Schodek, "Structures", Pearson Education  
 [R4] R. Vaidyanathanand & P. Perumal, "Comprehensive Structural Analysis", Laxmi Publications  
 [R5] Sujitkumar Roy, "Fundamental of Structural Analysis", S. Chand Publication.  
 [R6] D.S. Prakash Rao, "Structural Analysis", University Press.  
 [R7] C. K. Wang, "Statically Indeterminate Structures", McGraw Hill

**NCC/ NSS/ SPORTS/ COMMUNITY SERVICES/ ECO CLUB**  
**(General Elective-II)**

Paper Code: ETVSS-751/ 753/ 755/ 757/ 759

L T/P C

Paper: NCC/NSS/ Sports/ Community Services/ ECO Club

0 2 1

*Students should actively participate in either of the above activities of the institute during academic session. Credits shall be awarded accordingly based on final assessment by internal institute committee constituted by the Principal/ Director of the respective institutes. Students are encouraged organize events and awards if any shall be distributed to students during annual day/ specific function day accordingly*



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**YOGA**  
**(General Elective-II)**

**Paper Code: ETVSS-761**  
**Paper: Yoga**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>2</b>	<b>1</b>

**INSTRUCTIONS TO PAPER SETTERS:**

**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

**Introduction:** Yoga education in Schools/Colleges/ Institutions/ Organizations/Universities etc. can immensely contribute to health of children by disseminating knowledge and awareness about the value of health, inculcating and nurturing health promoting habits and life style.

The Paper on YOGA has been initiated by USET for the students in a new skill development programme known as B.Voc programme. Currently, launched in 09 Govt. Institutions affiliated to GGSIP University.

**Aim and Objectives:**

The aim of the Paper is to introduce Yoga. The specific objectives are:

- To impart Yoga education in schools/colleges/Institutions for prevention of disease and promotion of health;
- To train faculty members in Yogic principles and practices.
- To prepare and distribute standardized Yoga teaching and training materials with reference to institute health.

**UNIT-I**

- ❖ Brief introduction to origin of Yoga, Psychological aspects leading to origin of Yoga, Hindu Mythological concepts about origin of Yoga
- ❖ History and Development of Yoga
- ❖ Etymology and Definitions of Yoga, Aim and Objectives of Yoga, Misconceptions about Yoga, True Nature of Yoga
- ❖ General Introduction to Schools of Yoga
- ❖ Principles of Yoga, Yoga Practices for Health and Harmony

**UNIT-II**

**Yoga Traditions and Classical Schools of Yoga.**

- ❖ Yoga's Traditional Source
- ❖ Different's traditions of Yoga.
- ❖ Contemporary Yoga Practice.
- ❖ Concepts and Practices of Yoga in others religions.

**UNIT-III**

**Experimental Study Yoga:**

- ❖ Aasan, Surya Namaskar, Pranayam, Sukshma-Kriya, Dhyana-Mudra, Shatkarma

**UNIT-IV**

**Yoga and You**

- ❖ **Concept of Health-** Aahaar, Nidra, Bharmacharaya, Viyayaam.
- ❖ **Aarogya** - Prevention, Cure and Remedies.
- ❖ Life Management and Development.

**Reference Book(s)**

- [R1] Singh S. P & Yogi Mukesh, "Foundation of Yoga", Standard Publication, New Delhi, 2010  
 [R2] Radhakrishnan S, "Indian Philosophy", (Vol. I & II) II Edition, Oxford University, UK, 2008.  
 [R3] Swami Devvarata, "AshtangYog", 119, Guttam Nagar.  
 [R4] Prof. Ram Harsh Singh, "Swasth Viritam"  
 [R5] Swami Prabhavanand, "Spiritual Heritage of India (English)", Sri Ramkrishna Math, Madras, 2004

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**YOGA PRACTICAL  
I.A**

**I. RECITATION OF HYMNS & HASTA MUDRA**

- 1.1 Recitation of Pratah-smaran and Shanti Mantras
- 1.2 Recitation of Pranava Japa and Soham Japa
- 1.3 Recitation of Hymns from Upanishad & Yoga Texts
- 1.4 Hasta Mudra: Chin, Jnana, Hridaya, Bhairav, Yoni

**II. SHATKARMA**

- 2.1 Dhauti (Kunjal, Vamana Dhauti, Vastra Dhauti)
- 2.2 Neti (Jalneti, Sutranefti)
- 2.3 Kapalbhata and its variants
- 2.4 Agnisara

**III. BREATHING PRACTICES**

- 3.1 Breath Awareness: Shwas-prashwas Sanyaman
- 3.2 Abdomen, Thoracic & Clavicular Breathing, Abdomen + Thoracic Breathing, Abdomen + Thoracic + Clavicular Breathing
- 3.3 Yogic Breathing: Pause Breathing (Viloma Pranayama), Spinal Passage Breathing (Sushumna Breathing)
- 3.4 Practice of Puraka, Rechaka & Kumbhaka (Antar & Bahya Kumbhaka)



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**YOGA PRACTICAL**  
**I.B**

**YOGIC SUKSMA AND STHULA VYAYAMA, NABHI PAREEKSHA**

**1.1 YOGIC SUKSMA VYAYAMA**

1. Uccharana-sthalatatha Vishudha-chakra-shuddhi (for throat and voice)
2. Prarthana (Prayer)
3. Buddhi-tatha-dhritishakti-vikasaka (for developing will power)
4. Smaranashakti-vikasaka (for improving the memory)
5. Medhashakti-vikasaka (for improving the intellect and memory)
6. Netrashakti-vikasaka (for the eyes)
7. Kapolashakti-varadhaka (for the cheeks)
8. Karnashakti-varadhaka (for the ears)
9. Grivashakti-vikasaka (for the Neck) (i) (A & B)
10. Grivashakti-vikasaka (for the Neck) (ii) (A & B)
11. Grivashakti-vikasaka (for the Neck) (iii)
12. Skandha-tatha-bahu-mulashakti-vikasaka (for the shoulders)
13. Bhuja-bandhashakti-vikasaka
14. Kohinishakti-vikasaka
15. Bhuja-vallishakti-vikasaka
16. Purna-bhujashakti-vikasaka (for the arms)
17. Mani-bandhashakti-vikasaka
18. Kara-prsthashakti-vikasaka
19. Kara-talashakti-vikasaka
20. Anguli-mulashakti-vikasaka (for the fingers) (A & B)
21. Anguli- shakti-vikasaka (for the fingers) (A & B)
22. Vaksha-sthalashakti-vikasaka (for the chest) (1)
23. Vaksha-sthalashakti-vikasaka (for the chest) (2)
24. Udarashakti-vikasaka (for the abdomen) (i)
25. Udarashakti-vikasaka (for the abdomen) (ii)
26. Udarasakti-vikasaka (for the abdomen) (iii)
27. Udarashakti-vikasaka (for the abdomen) (iv)
28. Udarashakti-vikasaka (for the abdomen) (v)
29. Udarashakti-vikasaka (for the abdomen) (vi)
30. Udarashakti-vikasaka (for the abdomen) (vii)
31. Udarashakti-vikasaka (for the abdomen) (viii)
32. Udarashakti-vikasaka (for the abdomen) (ix)
33. Udarashakti-vikasaka (for the abdomen) (x) (A, B & C)
34. Kati shakti-vikasaka (for the waist) (i)
35. Kati shakti-vikasaka (for the waist) (ii)
36. Kati shakti-vikasaka (for the waist) (iii)

37. Kati shakti-vikasaka (for the waist) (iv)
38. Kati shakti-vikasaka (for the waist) (v)
39. Muladhara-chakra-suddhi (for the rectum)
40. Upasthatatha-svadhithana-chakra-suddhi (for the genital organs)
41. Kundalinishakti-vikasaka (for the kundalini)
42. Janghashakti-vikasaka (for the thighs) (i) (A & B)
43. Janghashakti-vikasaka (for the thighs) (ii) (A & B)
44. Janushakti-vikasaka (for the knees)
45. Pindalishakti-vikasaka (for the calves)
46. Pada-mulashakti-vikasaka (A & B)
47. Gulpha-pada-pristha-pada-tala-shakti-vikasaka (for the ankles and the feet)
48. Padangulishakti-vikasaka (for the toes)

### 1.2 YOGIC STHULA VYAYAMA

1. Rekha-gati (Walking in a Straight line)
2. Hrid-gati (Injanadaur – the Locomotive Exercise)
3. Utkurdana (Jumping Exercise)
4. Urdhva-gati (Upward Movement)
5. Sarvanga-pusti (Developing the Entire body) &

### 1.3 NABHI PAREEKSHA

### II. SURYA NAMASKARA

### III. YOGASANA (Standing Postures and body alignment)

- 3.1 Tadasana, Vrikshasana, Urdhva-Hastottanasana, Kati Chakrasana
- 3.2 ArdhaChakrasana, Paada Hastasana
- 3.3 Trikonasana, Parshva Konasana
- 3.4 Veerabhadrasana and its variations

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**YOGA PRACTICAL**  
**II.A**

**I. SHATKARMA**

1.1 Dhauti

1.2 Neti

1.3 Nauli Madhyama, Vama, Dakshina and Nauli Chalana

1.4 Trataka (Jatru and Jyoti)

**II. PRANAYAMA**

2.1 Nadi Shodhana (Technique 1: Same Nostril Breathing)

2.2 Nadi Shodhana (Technique 2: Alternate Nostril Breathing)

2.3 Nadi Shodhana (Technique 3: Alternate Nostril Breathing + Antar Kumbhak)

2.4 Nadi Shodhana (Puraka + Antar Kumbhak + Rechaka + Bahya Kumbhak) (1:4:2:2)

**2.5 BHRAMARI PRANAYAMA****III. PRACTICES LEADING TO MEDITATION**

3.1 Pranav and Soham Japa

3.2 Yoga Nidra (1, 2, 3)

3.3 Antarmauna

3.4 Ajapa Dharana (Stage 1, 2, 3)



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**YOGA PRACTICAL**  
**II.B**

**I. YOGASANA (Sitting Postures)**

- 1.1 Dandasana, Swastikasana, Padmasana, Vajrasana, Supta Vajrasana  
 1.2 Kagasana, Utkatasana, Gomukhasana, Ushtrasana, Shashankasana,  
 1.3 Janusirasana, Paschimottanasana, Bhramacharyasana, Mandukasana, Utthana Mandukasana  
 1.4 Vakrasana, Ardha Matsyendrasana, Marichayasana, Simhasana

**II. YOGASANA (Supine lying Postures)**

- 2.1 Pavanamuktasana  
 2.2 Utthana-padasana, Ardha Halasana,  
 2.3 Halasana  
 2.4 Setubandha Sarvangasana  
 2.5 Sarvangasana  
 2.6 Matsyasana  
 2.7 Chakrasana  
 2.8 Shavasana

**III. YOGASANA (Prone lying Postures)**

- 3.1 Makarasana  
 3.2 Bhujangasana  
 3.3 Shalabhasana  
 3.4 Dhanurasana  
 3.5 Kapotasana  
 3.6 Raja Kapotasana

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**YOGA PRACTICAL**  
**III.A**

**I. BANDHA**

- ❖ Jivha Bandha
- ❖ Jalandhara Bandha
- ❖ Uddiyana Bandha
- ❖ Mula Bandha
- ❖ Maha Bandha
- ❖ Tri Bandha

**II PRANAYAMA (with Antar & Bahya Kumbhaka)**

- 2.1 Surya-bhedi and Chandra-bhedi Pranayama
- 2.2 Ujjayi Pranayama
- 2.3 Sheetal Pranayama
- 2.4 Shitkari Pranayama
- 2.5 Bhastrika Pranayama

**III. PRACTICES LEADING TO MEDITATION**

- 3.1 Ajapa Dharana (Stage 4, 5, 6)
- 3.2 Yoga Nidra (4, 5)
- 3.3 Practices leading to Breath Meditation
- 3.4 Practices leading to Om Meditation
- 3.5 Practices leading to Vipassana Meditation

**Practices leading to Preksha Meditation**

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**YOGA PRACTICAL**  
**III.B**

**I. YOGASANA**

- 1.1 Siddhasana, Bhadrasana,
- 1.2 Baddha Padmasana, Uttitha Padmasana,
- 1.3 Bhunamanasana, Hanumanasana
- 1.4 Bakasana, Kukkutasana, Garbhasana
- 1.5 Matsyendrasana, Marjariasana,
- 1.6 Padangusthasana, Hastapadangusthasana
- 1.7 Garudasana, Vatayanasana, Natarajasana
- 1.8 Mayurasana, Padma Mayurasana
- 1.9 Sirshasana and its variations
- 1.10 Ekapada and Dwipada Kandarasana

**II. MUDRAS**

- 2.1 Yoga Mudra
- 2.2 Maha Mudra
- 2.3 Shanmukhi Mudra
- 2.4 Shambhavi Mudra
- 2.5 Kaki Mudra
- 2.6 Tadagi Mudra
- 2.7 Vipareet Karni Mudra
- 2.8 Simha Mudra

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**FOUNDATION ENGINEERING LAB**  
(Core Elective-II)

**Paper Code: ETVCT-753**  
**Paper: Foundation Engineering Lab**

L	T/P	C
0	4	4

**Note:**-The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice. **NOTE:** Field visits may be organized to construction site for further exploring foundation engineering aspects.

**List of Experiments:**

1. Study of Consolidation test
2. Study of Triaxial compression test
3. Study Unconfined compression test
4. Study of Direct shear test
5. Study Plate load test
6. Report/ study based on Unit I
7. Report/ study based on Unit II
8. Report/ study based on Unit III
9. Report/ study based on Unit IV
10. Field visit to Testing centres/ construction sites



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**ADVANCED SURVEYING LAB**  
(Core Elective-II)

**Paper Code: ETVCT-755**  
**Paper: Advanced Surveying Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>4</b>	<b>4</b>

**Note:-**The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

**List of Experiments:**

1. Study of Digital Planimeter
2. Computation of areas using Planimeter
3. Study of EDM
4. Field/ Indore Measurements using Distometer
5. Study of electronic/ Digital theodolite
6. Computations of Horizontal angles and vertical angles
7. Traversing and plotting
8. Trigonometric Leveling
9. Study of Total station
10. Study of GPS
11. Field visit to SOI/ Surveying organizations/ construction sites



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**LANGUAGE LAB**  
**(Common to all Disciplines)**

**Paper Code: ETVHS-751**  
**Paper: Language Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>3</b>	<b>3</b>

**Note:-** The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

**List of Exercises:**

- 1. Fundamentals of Inter-personal Communication and Building Vocabulary**
  - Self introduction and introducing others
  - Situational Dialogues: Starting a dialogue and responding relevantly & appropriately
  - Role-Play-Expressions in various situations
  - Social and Professional Etiquette: greetings, apologies, requests etc
  - Telephone Etiquette.
- 2. Non-verbal Communication**
  - Gesture, posture and body language
  - Facial Expressions.
  - Paralinguistic Skills
  - Proxemics
  - Eye Gaze.
  - Haptics
  - Appearance.
- 3. Reading Comprehension and Listening Exercise**
  - General vs Local Comprehension
  - Skimming, Scanning
  - Inference drawing
  - Critical reading
  - Listening , Hearing
- 4. Presentation Skills**
  - Oral presentation
  - Seminar/ conference Paper Presentation
  - PPTs and Written presentation through poster/projects/reports/e-mails/assignments etc
  - Camera ready presentation
- 5. Group Discussion**
  - Dynamics of Group Discussion
  - Intervention
  - Summarizing
  - Body Language and Voice, Intonation
- 6. Interview Skills**
  - Interview etiquette
  - Body posture and body language
  - Voice, intonation and modulation
  - Fluency and organization of ideas
  - Rubrics for evaluation: Concept and process, pre-interview planning, opening strategies, answering techniques,
  - Interview through tele-conferencing and video-conferencing
  - Mock interview
  - Campus placement interview
- 7. Public and Professional Speaking**
  - Extempore
  - Public Speech
  - Professional speech/lecture
- 8. Articulation and Management**
  - Time management
  - Articulation and expression
  - Assertiveness
  - Psychometrics
  - Stress management

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**SOFTWARE TRAINING IN CIVIL ENGINEERING****Paper Code: ETVCT-751****Paper: Software Training in Civil Engineering**

L	T/P	C
0	3	3

Students have to undergo software training related to Civil Engineering during Semester. Demonstration of various civil engineering software, such as STAAD-Pro/ ETAB/ MS Project/ Primavera Project Planner/ Auto Civil/ MX Road/ Auto plotter or any other/equivalent, shall be arranged for student during the semester. Further weekly presentations and viva-voce will be conducted in this semester. Emphasis must be given to presentations by various organizations on CAD software. Emphasis must be given to prepare a report on case study comprising of above features which may include- Drawings/ Design (based on RCC/ Steel design), Programming (for various Construction/ Civil engineering problems). More experiments may be designed by the respective institutes as per their choice.

**NOTE:**

Existing CAD/ Computer labs may be enhanced as per requirements for effective utilization of resources. CAD labs must be nurtured to meet out the demands of the construction/ Civil engineering industry



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**MINOR PROJECT****Paper Code: ETVCT-757****L T/P C****Paper: Minor Project****0 8 4***Objectives: The main aim of the project shall be to:**a) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.**b) Develop understanding of subject based knowledge given in the class room in the context of its application at work places**c) Develop first-hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems in the world of work.**d) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.*

This should be considered as sacred ritual for the fulfilment of above objectives. Institutes have to establish close linkage with relevant organizations for providing such an experience with the use of its training placement division. Projects selected should not be too complex which is beyond the level of the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them.

Students may choose a project based on any subject of Construction /Civil Engineering. The students will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format.

The project work may be based on development of designs, site/ field work, Programming/ CAD based, case studies, market survey based on topics of Construction/ Civil engineering interest. It will be a group project.

**NOTE:**

Project Lab has to be developed and nurtured. Various testing equipment such as non-destructive testing equipment, water analysis testing equipment etc. as per requirements of projects and needs of the industry be procured for enhancing project lab for the benefit of students. Also project works should be designed in such a way so that existing laboratories may be utilized optimally. Enhancement of project lab is a continuous process and need based upgradations are necessary.

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**SEMINAR**

**Paper Code: ETVCT-761**  
**Paper: Seminar**

L	T/P	C
0	4	2

**Objective:**

The objective is to assess and enhance the presenting capability of the students. Also to impart training to a student to face audience and present his ideas and thus creating in him self-esteem and courage that is essential for an engineer. *Students are required to give a seminar on Construction/ Civil Engineering Projects/Visits/Case Studies for about 10 minutes. Seminar will be liberally attended by faculty present in college in conference hall and award marks to the students based on presentation (50% weightage) and Interjections by the candidates will be observed in assessment (50% weightage).* Each student shall submit hard copy and soft copy of a write up of the seminar topic.



**CONSTRUCTION MANAGEMENT**

**Paper Code: ETVCT-702**  
**Paper: Construction Management**

L	T/P	C
3	0	3

**INSTRUCTIONS TO PAPER SETTERS:****MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

**Objective & Pre-requisite:** This course requires basic knowledge of Building construction and construction material subjects. This course is aimed at providing both basic and advanced exposure to Construction Project Management so as to enable the manager/ consultant of tomorrow to successfully plan and complete sophisticated projects within the constraints of capital, time and other resources. The course also deals with basic concept of network analysis.

**Learning Outcome:** Ability to understand the intricacies of construction management. Usage and preparation of bar charts. Understanding of concepts PERT and CPM. Enhanced knowledge of usage of Construction equipment.

**UNIT-I****Introduction:**

Objectives and functions of project management, Classification of construction, stage, team-their functions and relationship, Importance of construction planning, Stages of construction planning Finance and cost accounting, Quality control, Methods of motivation and incentives.

[T1, T2, T3][No. of Hrs.: 11]

**UNIT-II**

**Scheduling construction works by bar charts** - Preparation of bar charts for simple construction work, Limitations of bar charts

**Network Techniques:** Introduction to CPM/PERT methods and their use in construction planning, preparation of construction schedules for jobs, materials, equipments, labour and funds and project monitoring.

[T1, T2, T3][No. of Hrs.: 12]

**UNIT III**

**Construction Equipments:** Different types of construction equipments viz., earth moving equipments, dewatering and pumping equipments, grouting equipments, pile driving equipments and other construction equipments such as conveyors, cranes, concrete mixers, vibrators, road construction machinery, rollers, compactors etc. Factors affecting the selection of construction equipments.

[T1, T2, T3][No. of Hrs.: 11]

**UNIT IV**

**Equipment Management:** Productivity, operational cost, owning and hiring cost and the work motion study.

**Contract Management:** Legal aspects of contraction, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relatives advantages and disadvantages. Elements of tender operation, settlement of disputes, arbitration and commissioning of the project.

[T1, T2, T3][No. of Hrs.: 11]

**NOTE:**

Field visits may be organized to construction site to explain the various construction project components and equipment. Guest lectures by field engineers/ consultants/ experts may be organized in the institute for the benefit of students.

**TextBook(s):**

- [T1] Sreenath L. S., "PERT and CPM", Affiliated East West Press, New Delhi.  
 [T2] Punmia B. C., and Khandelwal K. K., "PERT and CPM", Laxmi Pub., New Delhi.  
 [T3] Verma Mahesh, "Construction Planning and Management", Delhi Metropolitan.

**References Books:**

- [R1] Peurifoy R. L., "Construction Planning, Equipments and Methods", McGraw Hill Book Co. Inc., New York.

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- [R2] Satyanarayanan & Saxena, "Construction Planning and Equipment", Standard Publishers Distributors, New Delhi.
- [R3] Graham M. Winch, "Managing Construction Projects", John Wiley and Sons, 2010
- [R4] Henry F. W., "Construction Project Management: Planning and Scheduling", Naylor -Delmar Pub
- [R5] Peurifoy, "Construction Planning, Equipment and Methods", Tata McGraw Hill
- [R6] Joseph Frein, "Handbook of Construction Management and Organization", Springer
- [R7] Harpal Singh, "Construction Management and Accounts", Tata McGraw Hill Publishing Co., ND
- [R8] Dharwadker, PP; "Management in Construction Industry", Oxford and IBH Publishing Company, ND
- [R9] Gahlot PS; Dhir, BM; "Construction Planning and Management", Wiley Eastern Limited, New Delhi



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**RAILWAY, BRIDGES, AIRPORT AND TUNNEL ENGINEERING**  
(Core Elective-IV)

**Paper Code: ETVCT-704**

**Paper: Railway, Bridges, Airport and Tunnel Engineering**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**INSTRUCTIONS TO PAPER SETTERS:**

**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

***Objective & Pre-requisite:** Knowledge of highway engineering subject is a pre requisite for this subject. The objectives are to learn various aspects of Railway engineering, bridge engineering, airport & tunnel engineering*

***Learning Outcome:** Enhanced ability to understand the different aspects of railway engineering for utilizing in the field. Ability to understand salient features of Bridge, airport and tunnel engineering.*

**UNIT-I**

**RAILWAYS:**

**Introduction to Indian Railways, Railway surveys:** Factors influencing the railways route, brief description of various types of railway survey,

**Classification of permanent way describing its component parts; Rail Gauge, Rails, Rail Fastenings:**

**Rail joints, Sleepers, Ballast, Crossings and signallings:** Brief description regarding different types of crossings/ signallings (Latest electronics operated signal devices).

**Maintenance of track:** Necessity, maintenance of track, inspection of soil, track and fixtures; maintenance and boxing of ballast maintenance gauges, tools.

**Earth work an drainage:** Features of rail road, bed level, width of formation, side slopes, drains, methods of construction, requirement of drainage system.

[T1, T2, T3][No. of Hrs.: 12]

**UNIT-II**

**BRIDGES**

**Introduction Bridges, Classification of Bridges:** Structural elements and suitability-permanent and temporary, deck level – Deck, through and semi-through, timber, masonry, steel, RCC, pre-stressed, - Grade Separators- Railway Over bridges (ROB), Railway under bridge (RUB), Beam type –RCC, T-Beam, steel girder bridges, plate girder and box girder, balanced cantilever, Trussed bridges. Arch type – open spandrel and filled spandrel barrel and rib type - Suspension type – unstiffened and stiffened and table (its description with sketches) - According to the position of highest flood level submersible and non- submersible; IRC classification.

**Bridge Foundations:** Introduction to open foundation, pile foundation, well foundation.

**Piers, Abutments and Wing-walls, Bridge bearings, Maintenance of Bridges**

[T1, T2, T3][No. of Hrs.: 11]

**UNIT-III**

**AIRPORT ENGINEERING**

Necessity of study of airport engineering, aviation transport scenario in India. Factors to be considered while selecting a site for an airport with respect to zoning laws. Introduction to Runways, Taxiways and Apron [8]

[T1, T2, T3][No. of Hrs.: 11]

**UNIT-IV**

**TUNNELS**

**Definition and necessity of tunnels, Typical section** of tunnels for a national highway and single and double broad gauge railway track.

**Ventilation:** Necessity and methods of ventilation, by blowing, exhaust and combination of blowing and exhaust.

**Drainage method** of draining water in tunnels.

**Lighting** of tunnels

[T1, T2, T3][No. of Hrs.: 11]



**NOTE:**

Field visits may be organized to Bridge construction site or a Bridge/ Air Port/ Tunnel construction site/Railways tracks to explain the various components. Guest lectures by field engineers/ consultants/ experts may be organized in the institute for the benefit of students.

**Text Books:**

- [T1] Saxena and Arora, "A Text Book of Railway Engineering", Dhanpat Rai Publications  
 [T2] Khanna and Arora, "Airport Planning and design", Nemchand Bros  
 [T3] Vazirani V.N, Chandola S. P, "Railways, Bridges and Tunnels", Khanna Publications, New Delhi, 1997

**References Books:**

- [R1] Horonjeff, "Planning and Design of Airports", TMH  
 [R2] Mundrey, "Railway Track Engineering", TMH  
 [R3] Docks and Harbors, Levison Francis, Clarendon press, (2006)  
 [R4] John O. Bickel, Thomas R. Kuesel, Elwyn H King, "Tunnel Engineering Handbook", CBS Publication.  
 [R5] Rangwala, S.C., "Railway Engineering", Anand, Charotar Book Stall  
 [R6] Victor Johnson, "Essentials of Bridge Engineering" Oxford and IBH, Delhi  
 [R7] Rangwala S.C., "Bridge Engineering", Anand, Charotar Book Stall



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**REPAIR AND REHABILITATION OF STRUCTURES**  
(Core Elective-IV)

Paper Code: ETVCT-706

L	T/P	C
3	0	3

Paper: Repair and Rehabilitation of Structures

**INSTRUCTIONS TO PAPER SETTERS:****MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

**Objectives & Pre-requisite:** Proper understanding of Construction/ Civil engineering subjects is a necessity and pre requisite of this subject. One of the major concerns of a civil engineer is to take care of the building works, already constructed, in order to keep these buildings in utmost workable conditions. Usually it is being felt that the buildings deteriorate faster for want of care and proper maintenance. The buildings usually have a shabby appearance due to cracks, leakage from the roofs and sanitary/water supply fittings. Thus the need for teaching the subject in proper perspective has arisen making students aware of importance of maintenance of buildings.

**Learning Outcomes:** Enhanced ability to understand the repair and rehabilitation of existing structures. Better understanding of maintenance of structure, diagnosis of building, evaluating concrete in concrete structures, repair of surface defects of concrete.

**UNIT-I**

Need of repair and Maintenance of structure, Agencies Causing Deterioration (Sources, Causes and Effects), Effects of various agencies of deterioration on various building materials. Investigation and Diagnosis of Defects, root causes. Main causes of building defects in various building elements- foundations, basements and DPC, Walls, Column and Beams, Roof and Terraces, Joinery, Decorative and protective finishes, Services and Defects caused by dampness

[T1, T2, T3, T4][No. of Hrs.: 11]

**UNIT-II**

Systematic approach/procedure of investigation, sequence of detailed steps for diagnosis of building defects/problems, introduction non-destructive and others tests on structural elements and materials to evaluate the condition of the building, Materials for Repair, maintenance and protection, Remedial Measures for Building Defects- Preventive maintenance considerations, Surface preparation techniques for repair, Crack repair methods.

[T1, T2, T3, T4][No. of Hrs.: 11]

**UNIT-III**

**Evaluating concrete in concrete structures:** site survey, cracking, disintegration and spalling, scaling, dusting, distortion, erosion, seepage, crack survey, joint inspections, physical and chemical analysis, NDT testing

**Causes of distress and deterioration:** Accidental loading, chemical reactions, corrosion, freezing and thawing, settlement and movement, shrinkage, temperature changes.

[T1, T2, T3, T4][No. of Hrs.: 11]

**UNIT-IV**

**Repair of surface defects of concrete:** Bug holes, Form tie holes, Honey comb and larger voids; Repair of corrosion in RCC elements- Steps in repairing, Prevention of corrosion in reinforcement; Material placement techniques- Pneumatically applied, Open top placement, Pouring from the top to repair bottom face, Birds mouth, Dry packing, Form and pump, Preplaced – aggregate concrete, Trowel applied method; Repair of DPC against Rising Dampness- Physical methods, Electrical methods, Chemical methods; Repair of walls- Repair of mortar joints against leakage, Efflorescence removal; Waterproofing of wet areas and roofs- Water proofing of wet areas, Water proofing of flat RCC roofs, Various water proofing systems and their characteristics; Repair of joints in buildings- Types of sealing joints with different types of sealants, Techniques for repair of joints, Repair of overhead and underground water tanks.

[T1, T2, T3, T4][No. of Hrs.: 12]

**Instructional Strategy**

*This is very important course and efforts should be made to find damaged/defective work spots and students should be asked to think about rectifying/finding solution to the problem. Visits to work site, where repair and*

*maintenance activities are in progress can be very useful to students. Guest lectures by field engineers/ consultants/ experts may be organized in the institute for the benefit of students.*

**Text Book(s)**

- [T1] Gahlot P.S. and Sanjay Sharma, "Building Defects and Maintenance Management", CBS Publishers, New Delhi  
 [T2] Nayak, BS, "Maintenance Engineering for Civil Engineers", Khanna Publishers, Delhi  
 [T3] Ransom, WH "Building Failures - Diagnosis and Avoidance", Publishing E and F.N. Span  
 [T4] Hutchinson, BD; et al, "Maintenance and Repair of Buildings", Published by Newness – Butterworth

**Reference Book(s):**

- [R1] S. N. Sinha, "RCC Design", Tata McGraw-Hill Publishing Ltd, 2002  
 [R2] Allen R.T.L, "Repair Of Concrete Structures", John Willey and Sons, 1987  
 [R3] "Handbook on repair and rehabilitation of RCC buildings", published by CPWD, Government of India.  
 [R4] <http://cpwd.gov.in/Units/handbook.pdf>  
 [R5] R. Dodge Woodson, "Concrete Structures: Protection, Repair and Rehabilitation", Elsevier Publications, 2009.  
 [R6] B .Sivagnanam –"Rehabilitation-Indian Concrete Journal", vol.76, December 2002  
 [R7] [http://www.structural.net/Repair/repair\\_concrete.html](http://www.structural.net/Repair/repair_concrete.html)  
 [R8] [http://www.icivilengineer.com/Structural\\_Engineering/Structure\\_Maintenance/](http://www.icivilengineer.com/Structural_Engineering/Structure_Maintenance/)



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**WATER RESOURCES ENGINEERING**  
(Core Elective-V)

Paper Code: ETVCT-708

Paper: Water Resources Engineering

L	T/P	C
3	1	4

**INSTRUCTIONS TO PAPER SETTERS:****MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

**Objective & Pre-requisite:** Basic knowledge of water engineering & fluid mechanics is a necessity for better understanding of this subject. The course deals with various principles and requirements of irrigation scheme involving canals/channels carrying clear or Sediment-Laden water, design of canal sections, sheet pile, cut-off walls, canal fall, distributory head regulator, cross regulator, cross drainage structures, canal head works, dams, spillways, guide bank and bank protection.

**Learning Outcomes:** Better understanding of concepts of water resources engineering. Ability to compute water requirement of crops in respect to irrigation. Clarity in the concepts of types of irrigation and related hydraulic structures and their design.

**UNIT-I**

**Introduction:** Definition, Necessity, Scope of irrigation science, benefits of irrigation, types of irrigation, multi-purpose river valley projects, soil moisture and crop water relations, consumptive use of water, ill effects of irrigation, principal Indian crop seasons and water requirements, water requirements of crops. Surface water sources and storage reservoirs: Ponds and lakes as surface sources, stream and rivers, types of reservoirs, Meaning of - capacity elevation curves of a river reservoirs, catchment yield and reservoir yield, reservoir losses, reservoir clearance.

[T1, T2][No. of Hrs.: 14]

**UNIT-II**

**Canal Irrigation:** Introduction, types of canal, parts of canal irrigation system, assessment of water requirements, estimation of channel losses, hydraulic design of channels, meaning of regime (Kennedy's theory and Lacey's theory). Canal outlets: Introduction, types of outlets, Non-modular outlets, pipe outlets, Semi-module or flexible outlets, rigid outlets. Types of falls, cross drainage works, energy dissipation. Diversion head works.

**Well irrigation:** Introduction, Division of sub-surface water, types of aquifer, storage coefficient, advantages and disadvantages of well irrigation over canal irrigation. Introduction to Hydrology: Definition, hydrologic cycle, measurement of rainfall, rain gauges. Definitions of-peak flow, flood frequency, flood hydrograph, infiltration, unit hydrograph.

[T1, T2][No. of Hrs.: 14]

**UNIT-III**

**Regulation works:** Falls, classification of falls, distributory head regulator, cross-head regulator, escape. Cross-Drainage structures: Necessity of cross-drainage structures, their types and selection, comparative merits and demerits, aqueduct, siphon aqueduct, super passage, and level crossing. (No design only concept)

**Diversion Headworks:** Selection of site and layout, different parts of diversion headworks, types of weirs and barrages, use of silt excluders and ejectors.

[T1, T2][No. of Hrs.: 14]

**UNIT-IV**

**Dams-**Types of dams, suitable sites, Embankment Dams, Freeboard, Suitability of Foundation, Slope protection, Factors and General Design Criteria for Gravity Dams, Forces on gravity Dam, Causes of failure of a gravity Dam, mass concreting of dams, Stability Analysis of Gravity Dams. Main components of Spillway, Types of spillways, energy dissipaters, Cavitations, River training objectives, bank protection.

[T1, T2][No. of Hrs.: 14]

**NOTE:** Field visit to Dam/water resources project site may be carried out during the session for better understanding of concepts of this subject. Guest lectures by field engineers/ consultants/ experts may be organized in the institute for the benefit of students.

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**Text Book(s):**

- [T1] N N Basak, "Irrigation Engineering", Tata McGraw Hill Education Private Limited  
 [T2] G. L Asawa, "Irrigation and Water Resources Engineering", New Age Internal Publishers, New Delhi.  
 [T3] S. K. Garg, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, Delhi

**References Books:**

- [R1] Ralph A. Wurbs, Wisley P. James, "Water Resources Engineering", PHI, New Delhi.  
 [R2] R. K. Sharma and T. K. Sharma, "Irrigation Engineering", S. Chand and Company Ltd., New Delhi.  
 [R3] SatyaNarayana Murty Challa, "Water Resources Engineering [Principles and Practice]", New Age Intl.  
 [R5] Ven T Chow, David R Maidment, Larry W Mays, "Applied Hydrology", McGraw-Hill, New Delhi  
 [R6] Bharat Singh, "Fundamentals of Irrigation Engineering", Nem Chand and Brothers, Roorkee



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**PRE-STRESSED CONCRETE**  
(Core Elective-V)

**Paper Code: ETVCT-710**  
**Paper: Pre-stressed Concrete**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>4</b>

**INSTRUCTIONS TO PAPER SETTERS:**

**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

**Objective & Pre-requisite:**

*Basic knowledge of concrete technology is a pre requisite to learn this subject. To introduce the need for pre-stressing as well as the methods, types and advantages of pre-stressing to the students. Students will be introduced to the design of pre-stressed concrete structures subjected to flexure and shear.*

**Learning Outcomes:** *Clarity in the concepts of Pre stressed concrete, better understanding of material used & systems of pre-stressing, able to perform design for flexure & design of anchor zone and analysis and design of composite beams.*

**UNIT-I**

**Basic concepts** – Advantages – Materials required – Systems and methods of pre-stressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections – Losses of pre-stress – Estimation of crack width.

[T1, T2][No. of Hrs.: 14]

**UNIT-II**

**Design for Flexure and Shear:**

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

[T1, T2][No. of Hrs.: 14]

**UNIT-III**

**Deflection and Design of Anchorage Zone:**

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and IS1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

[T1, T2][No. of Hrs.: 14]

**UNIT-IV**

**Analysis and design of composite beams** – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

[T1, T2][No. of Hrs.: 14]

**NOTE:**

I.S. 1343 Code to be allowed in exams.

**Text Book(s):**

- [T1] Krishna Raju N., "Pre-stressed Concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012  
[T2] Pandit G. S. and Gupta. S. P., "Pre-stressed Concrete", CBS Publishers and Distributors Pvt. Ltd, 2012.

**Reference Book(s):**

- [R1] Rajagopalan. N, "Pre-stressed Concrete", Narosa Publishing House, 2002.  
[R2] Dayaratnam. P., "Pre-stressed Concrete Structures", Oxford and IBH, 2013  
[R3] Lin T.Y. and Ned. H. Burns, "Design of Pre-stressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.  
[R4] IS1343:1980, Code of Practice for Pre-stressed Concrete, Bureau of Indian Standards, New Delhi, 2012

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**CONSTRUCTION MANAGEMENT STUDY****Paper Code: ETVCT-752****Paper: Construction Management Study**

L	T/P	C
0	3	3

**Note:-**The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. The basic objective of this subject is to expose students to construction management aspects and to prepare report based on studies/ projects.

Following must be considered

- Based on PERT and CPM a minimum of 2 case studies/ projects/ construction & other work shall be prepared.
- A report on existing project management software has to be prepared.
- Field visit to construction project should conducted and studied in the management point of view
- Software training/workshop should be conducted (such as PRIMAVERA or MS Project)



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**MATLAB/OPEN SOURCE SOFTWARE TRAINING**  
(Such as R-Package)

**Paper Code: ETVCT-754**

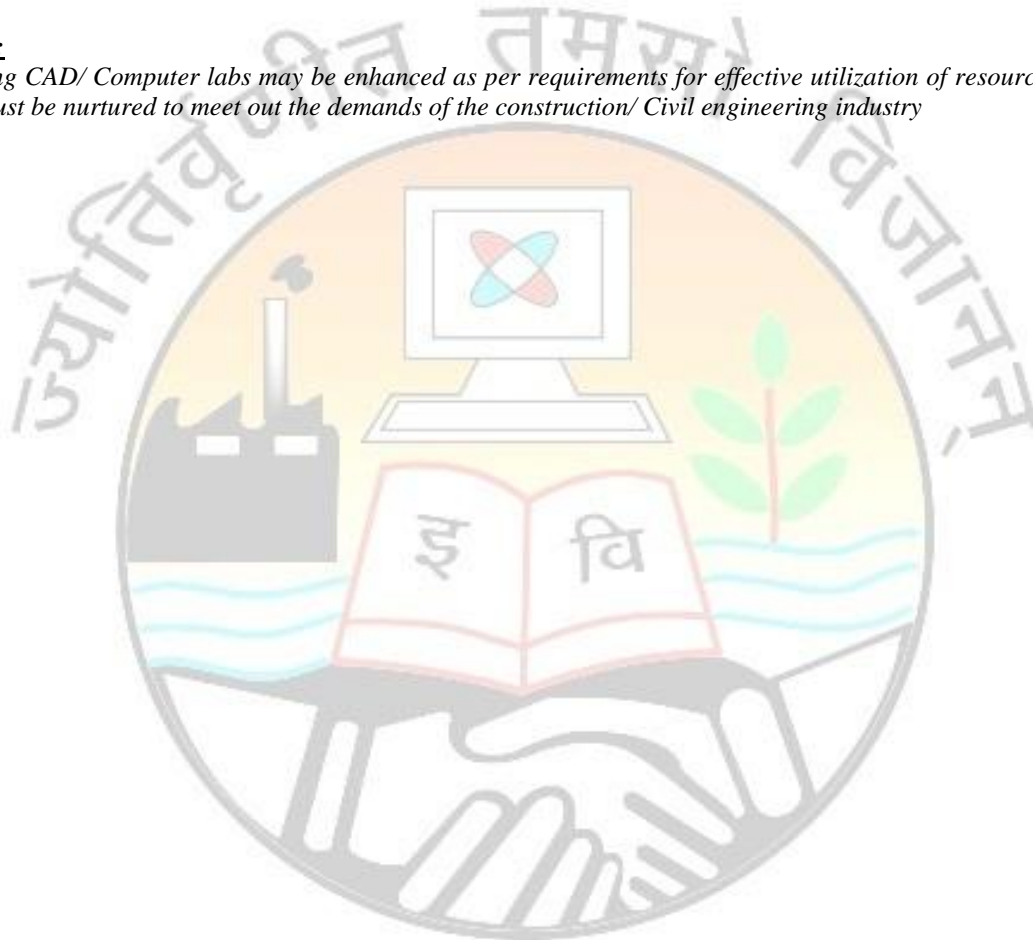
**Paper: MATLAB/Open Source Software (Such as R-Package)**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>3</b>	<b>3</b>

*Students have to undergo training with emphasis on rigorous practice of computational software such as MATLAB/ SCI LAB/ R-Pack/ Any such software during Semester. Student shall be trained for utilizing this in his/her project works. Importance must be given in organizing workshops during the session by various organizations. Practice sessions shall be designed by the respective faculty per requirements. Students are instructed to prepare algorithms/ procedures/ programs pertaining to various Construction/ Civil engineering problems. More experiments may be designed by the respective institutes as per their choice.*

**NOTE:**

*Existing CAD/ Computer labs may be enhanced as per requirements for effective utilization of resources. CAD labs must be nurtured to meet out the demands of the construction/ Civil engineering industry*



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**MAJOR PROJECT****Paper Code: ETVCT-758**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>24</b>	<b>12</b>

**Paper: Major Project****Objectives:** The main aim of the major project shall be to:

*a) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.*

*b) Develop understanding of subject based knowledge given in the class room in the context of its application at work places.*

*c) Develop first-hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems in the world of work.*

*d) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values. This should be considered as ritual for the fulfilment of above objectives.*

This should be considered as sacred ritual for the fulfilment of above objectives. Institutes have to establish close linkage with relevant organizations for providing such an experience with the use of its training placement division. Projects selected should not be too complex which is beyond the level of the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them.

Students may choose a project based on any subject of Construction /Civil Engineering. The students will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format.

The project work may be based on development of designs, site/ field work, Programming/ CAD based, case studies, market survey based on topics of Construction/ Civil engineering interest etc. It will be a group project.

**NOTE:**

Project Lab has to be developed and nurtured. Various testing equipment such as non-destructive testing equipment, water analysis testing equipment etc. as per requirements of projects and needs of the industry be procured for enhancing project lab for the benefit of students. Also project works should be designed in such a way so that existing laboratories may be utilized optimally. Enhancement of project lab is a continuous process and need based upgradations are necessary.

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