

**SCHEME OF EXAMINATION**

and

**SYLLABI**

for

**Bachelor of Technology  
Civil Engineering**

Offered by

**University School of Engineering and Technology****1<sup>st</sup> SEMESTER TO 8<sup>th</sup> SEMESTER****Guru Gobind Singh Indraprastha University  
Dwarka, Delhi – 110078 [INDIA]**[www.ipu.ac.in](http://www.ipu.ac.in)

**BACHELOR OF TECHNOLOGY  
(COMMON TO ALL BRANCHES)  
FIRST SEMESTER EXAMINATION**

Code No.	Paper ID	Paper	L	T/P	Credits	Status
<b>THEORY PAPERS</b>						
ETMA-101		Applied Mathematics-I	3	1	4	M
ETPH-103		Applied Physics-I	2	1	3	M
ETME-105		Manufacturing Processes	3	0	3	M
ETEE-107		Electrical Technology	3	0	3	M
ETHS-109		Human Values and Professional Ethics-I#	1	1	1	--
ETCS-111		Fundamentals of Computing	2	0	2	--
ETCH-113		Applied Chemistry	2	1	3	M
<b>PRACTICAL/VIVA VOCE</b>						
ETPH-151		Applied Physics Lab-I	-----	2	1	
ETEE-153		Electrical Technology Lab	-----	2	1	M
ETME-155		Workshop Practice	-----	3	2	M
ETME-157		Engineering Graphics Lab	-----	3	2	
ETCS-157		Fundamentals of Computing Lab	-----	2	1	--
ETCH-161		Applied Chemistry Lab	-----	2	1	--
		NCC/NSS*#	-----	-----	-----	--
<b>TOTAL</b>			<b>16</b>	<b>18</b>	<b>27</b>	

M: Mandatory for award of degree

#NUES (Non University Examination System)

\*#NCC/NSS can be completed in any semester from Semester 1 – Semester 4. It will be evaluated internally by the respective institute. The credit for this will be given after fourth Semester for the students enrolled from the session 2014-15 onwards. The camps/classes will be held either during Weekends/Holidays or Winter/Summer Vacations.

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**BACHELOR OF TECHNOLOGY  
(COMMON TO ALL BRANCHES)  
SECOND SEMESTER EXAMINATION**

Code No.	Paper ID	Paper	L	T/P	Credits	Status
<b>THEORY PAPERS</b>						
ETMA-102		Applied Mathematics-II	3	1	4	M
ETPH-104		Applied Physics-II	2	1	3	
ETEC-106		Electronic Devices	3	0	3	M
ETCS-108		Introduction to Programming	3	0	3	M
ETME-110		Engineering Mechanics	2	1	3	--
ETHS-112		Communication Skills	2	1	3	--
ETEN-114		Environmental Studies	2	1	3	--
<b>PRACTICAL/VIVA VOCE</b>						
ETPH-152		Applied Physics Lab-II	-----	2	1	
ETCS-154		Programming Lab	-----	2	1	M
ETEC-156		Electronic Devices Lab	-----	2	1	M
ETME-158		Engineering Mechanics Lab	-----	2	1	--
ETEN-160		Environmental Studies Lab	-----	2	1	--
		NCC/NSS*#	-----	-----	-----	--
<b>TOTAL</b>			<b>17</b>	<b>15</b>	<b>27</b>	

M: Mandatory for award of degree

#NUES (Non University Examination System)

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**BACHELOR OF TECHNOLOGY  
(CIVIL ENGINEERING)  
THIRD SEMESTER EXAMINATION**

Code No.	Paper ID	Paper	L	T/P	Credits	Status
<b>THEORY PAPERS</b>						
ETMA-203		Numerical Analysis and Statistical Techniques	3	1	4	
ETCE-203		Strength of Material	3	1	4	M
ETCE-205		Fluid Mechanics	3	1	4	M
ETCE-207		Building Materials and Construction	3	0	3	
ETCE-209		Surveying	3	1	4	M
ETCE-211		Engineering Geology	3	0	3	
<b>PRACTICAL/VIVA VOCE</b>						
ETMA-253		Numerical Analysis and Statistical Techniques lab	0	2	1	
ETCE-253		Fluid Mechanics Lab	0	2	1	
ETCE-255		Civil Engineering Drawing using CAD Lab	0	2	1	
ETCE-257		Surveying Lab	0	2	1	
ETCE-259		Geology and Building Material Lab	0	2	1	
		NCC/NSS*#	-	-	-	
<b>TOTAL</b>			<b>18</b>	<b>14</b>	<b>27</b>	

M: Mandatory for award of degree

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**BACHELOR OF TECHNOLOGY  
(CIVIL ENGINEERING)  
FOURTH SEMESTER EXAMINATION**

Code No.	Paper ID	Paper	L	T/P	Credits	Status
<b>THEORY PAPERS</b>						
ETCE-202		Water Engineering	3	1	4	
ETCE-204		Structural Analysis	3	1	4	M
ETCE-206		Hydraulics and Hydraulic Machines	3	1	4	M
ETCE-208		Advanced Surveying	3	0	3	
ETCE-210		Soil Mechanics	3	1	4	M
ETCE-212		Design of Concrete Structure	3	1	4	M
<b>PRACTICAL/VIVA VOCE</b>						
ETCE-252		Cement and Concrete Testing Lab	0	2	1	
ETCE-254		Structure Lab	0	2	1	
ETCE-256		Hydraulics Lab	0	2	1	
ETCE-258		Advanced Surveying Lab	0	2	1	
ETCE-260		Seminar <sup>#</sup>	0	2	1	
ETSS-250		NCC/NSS* <sup>#</sup>	-	-	1	
<b>TOTAL</b>			<b>18</b>	<b>15</b>	<b>29</b>	

M: Mandatory for award of degree

\*NCC/NSS can be completed in any semester from Semester 1 – Semester 4. It will be evaluated internally by respective institute. The credit for this will be given after fourth Semester for the students enrolled from the session 2014-15 onwards.

# NUES (Non University Examination System)

**Note:** Minimum of 2 week of Software Training related to Civil Engineering will be held after 4<sup>th</sup> Semester. However, weekly presentations and Viva Voce will be conducted in 5<sup>th</sup> Semester (**ETCE-359**).

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**BACHELOR OF TECHNOLOGY  
(CIVIL ENGINEERING)  
FIFTH SEMESTER EXAMINATION**

Code No.	Paper ID	Paper	L	T/P	Credits	Status
<b>THEORY PAPERS</b>						
ETHS-301		Communication Skills for Professionals	2	0	1	
ETCE-303		Advanced Structural Analysis	3	1	4	
ETCE-305		Design of Steel Structure	3	1	4	M
ETCE-307		Engineering Hydrology	3	1	4	M
ETCE-309		Geotechnical and Foundation Engineering	3	1	4	M
ETCE-311		Wastewater Engineering and Reuse	3	1	4	
<b>PRACTICAL/VIVA VOCE</b>						
ETHS-351		Communication Skills for Professionals Lab	0	2	1	
ETCE-353		Geotechnical Engineering Lab	0	2	1	
ETCE-355		Water and Wastewater Analysis Lab	0	2	1	
ETCE-357		Seminar on Civil Engineering projects/Visits/ Case Studies <sup>#</sup>	0	2	1	
ETCE-359		Software Training <sup>^</sup>	0	2	1	
<b>TOTAL</b>			<b>17</b>	<b>15</b>	<b>26</b>	

M: Mandatory for award of degree

<sup>^</sup>Minimum of 2 week of Software Training related to Civil Engineering was held after 4<sup>th</sup> Semester, however, weekly presentations and Viva Voce will be conducted in this semester (**ETCE-359**).

**Note:** Minimum of 2 week Surveying Camp (**ETCE 360**) will be held after 5<sup>th</sup> Semester, however, Viva-Voce will be conducted in the 6<sup>th</sup> Semester.

<sup>#</sup> NUES (Non University Examination System)

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**BACHELOR OF TECHNOLOGY  
(CIVIL ENGINEERING)  
SIXTH SEMESTER EXAMINATION**

Code No.	Paper ID	Paper	L	T/P	Credits	Status
<b>THEORY PAPERS</b>						
ETCE-304		Applications of Remote Sensing and GIS	3	0	3	
ETCE-306		Quantity Surveying and Cost Estimation	3	1	4	
ETCE-308		Open Channel, flow and Numerical Hydraulics	3	1	4	M
ETCE-310		Advance Structural Design	3	1	4	M
ETCE-312		Transportation Engineering -I	3	1	4	M
<b>GENERAL ELECTIVE –I(Choose any one)</b>						
ETEN-302		Environment System Optimization	3	1	4	
ETCE-302		Operation Research and Management	3	1	4	
ETIT-302		Decision Science	3	1	4	
<b>PRACTICAL/VIVA VOCE</b>						
ETCE-352		Transportation Engineering Lab	0	2	1	
ETCE-354		Applications of Remote Sensing Lab	0	2	1	
ETCE-356		Structures Design Lab	0	2	1	
ETCE-358		Seminar (topic should be linked to industrial training/Surveying Camp/ Soft skills learnt) <sup>#</sup>	0	2	1	
ETCE-360		Surveying Camp <sup>^#</sup>	0	0	1	
<b>TOTAL</b>			<b>18</b>	<b>13</b>	<b>28</b>	

M: Mandatory for the award of degree

**Note:** Minimum of four weeks of Industrial Training related to Civil Engineering will be conducted after 6<sup>th</sup> Semester; however, viva-voce will be conducted in 7<sup>th</sup> semester (**ETCE-457**).

<sup>^</sup> Minimum of 2 week Surveying camp (**ETCE-360**) was held after 5<sup>th</sup> Semester; however, viva-voce is to be conducted in this semester.

<sup>#</sup> NUES [Non University Examination System]

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**BACHELOR OF TECHNOLOGY  
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SEVENTH SEMESTER EXAMINATION**

Code No.	Paper ID	Paper	L	T/P	Credits
<b>THEORY PAPERS</b>					
ETCE-401		Economics for Engineers	3	1	4
ETCE-403		Irrigation Engineering	3	0	3
ETCE-405		Transportation Engineering-II	3	1	4
<b>CORE ELECTIVE-1(Choose any one)</b>					
ETCE-411		Water Resource System Planning	3	1	4
ETCE-413		Earthquake Technology	3	1	4
ETCE-415		Geo-synthetics and Reinforced Soil	3	1	4
ETCE-417		Structure Repair and Rehabilitation	3	1	4
<b>GENERAL ELECTIVE-2(Choose any one)</b>					
ETCE-419		Data Analytics	3	0	3
ETEN-419		Planning and Design of Green Buildings	3	0	3
ETEC-421		Data Communication and Networks	3	0	3
ETHS-419		Sociology and Elements of Indian History for Engineers	3	0	3
ETCS 425		Database Management Systems	3	0	3
<b>PRACTICAL/VIVA VOCE</b>					
ETCE-451		Irrigation Engineering Design	0	2	1
ETCE-453		Economics of Infrastructure Projects: Case Studies	0	2	1
ETCE-459		Lab Based on Core and General Elective	0	2	1
ETCE-455		Minor Project+	0	6	3
ETCE-457		Industrial Training related to Civil Engineering ^	0	0	1
<b>TOTAL</b>			<b>15</b>	<b>15</b>	<b>25</b>

^ Minimum of 4 weeks Industrial Training related to Civil Engineering was conducted at the end of 6<sup>th</sup> Semester; however, weekly presentations and viva-voce is to be conducted in this semester.

**Imp:-** Elective Paper will be floated if one-third of the total students opt for the same. It is advised that the decision about the elective subject for 8<sup>th</sup> Semester is done before 15<sup>th</sup> November every year before end of seventh semester. New Electives may be added as per requirement after getting it duly approved by BOS and AC respectively.

+ 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.



**BACHELOR OF TECHNOLOGY  
(CIVIL ENGINEERING)  
EIGHTH SEMESTER EXAMINATION**

Code No.	Paper ID	Paper	L	T/P	Credits
<b>THEORY PAPERS</b>					
ETHS-402		Human Values and Professional Ethics-II	1	0	1
ETCE-404		Planning and Management of Construction Projects	3	1	4
ETCE-406		Analysis and Design of Bridges	3	0	3
<b>CORE ELECTIVE – I(Choose any one)</b>					
ETCE-410		Transportation, Planning and Management	3	1	4
ETCE-412		Ground Water Assessment, Development and Management	3	1	4
ETCE-416		Advanced Geotechnical Engineering	3	1	4
<b>GENERAL ELECTIVE–II(Choose any one)</b>					
ETCE-418		FEM in Structural Engineering	3	1	4
ETEN-418		Ground Water Contamination and Mitigation measures	3	1	4
ETCE-422		Environment Engineering	3	1	4
ETCE-424		Offshore structural Engineering	3	1	4
<b>PRACTICAL/VIVA VOCE</b>					
ETCE-452		Estimation of Projects using applicable software	0	2	1
ETCE-454		Lab based on Elective I or II	0	2	1
ETCE-460		Major Projects*	0	12	8
<b>TOTAL</b>			<b>13</b>	<b>19</b>	<b>26</b>

\*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.

**Imp:-** Elective Paper will be floated if one-third of the total students opt for the same. It is advised that the decision about the elective subject is done before 15<sup>th</sup> November every year before end of seventh semester. New Electives may be added as per requirement after getting it duly approved by BOS and AC respectively.

**NOTE:**

1. The total number of the credits of the B.Tech. (CIVIL) Programme = 215.
2. Student shall be required to appear in examinations of all courses. However, to award the degree a student shall be required to earn a minimum of 200 credits including mandatory papers (M).

**FOR LATERAL ENTRY STUDENTS:**

1. The total number of the credits of the B.Tech. (CIVIL) Programme = 161.
2. Each student shall be required to appear for examinations in all courses Third Semester onwards. However, for the award of the degree a student shall be required to earn a minimum of 150 credits, including mandatory papers (M).

**NOMENCLATURE OF CODES GIVEN IN THE SCHEME OF**

**B.TECH AND M.TECH**

1. **ET** stands for Engineering and Technology.
2. **PE** stands for Power Engineering.
3. **ME** stands for Mechanical Engineering.
4. **MT** stands for Mechatronics.
5. **AT** stands for Mechanical and Automation Engineering.
6. **EE** stands for Electrical and Electronics Engineering.
7. **EL** stands for Electrical Engineering.
8. **IT** stands for Information Technology
9. **CS** stands for Computer Science and Engineering
10. **CE** stands for Civil Engineering
11. **EC** stands for Electronics and Communications Engineering.
12. **EN** stands for Environmental Engineering
13. **TE** stands for Tool Engineering
14. **MA** stands for Mathematics
15. **HS** stands for Humanities and Social Sciences
16. **SS** stands for Social Services



**APPLIED MATHEMATICS-I****Paper Code : ETMA-101****Paper : Applied Mathematics-I**

L	T	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 of 12.5 marks.

*Objective: The objective of the paper is to facilitate the student with the basics of Applied Mathematics that are required for an engineering student.*

**UNIT- I**

Successive differentiation: Leibnitz theorem for  $n^{\text{th}}$  derivative (without proof). Infinite series: Convergence and divergence of infinite series, positive terms infinite series, necessary condition, comparison test (Limit test), D'Alembert ratio test, Integral Test, Cauchy's root test, Raabe's test and Logarithmic test (without proof). Alternating series, Leibnitz test, conditional and absolutely convergence. Taylor's and Maclaurin's expansion (without proof) of function ( $e^x$ ,  $\log(1+x)$ ,  $\cos x$ ,  $\sin x$ ) with remainder terms, Taylor's and Maclaurin's series, Error and approximation.

**[T1], [T2][No. of hrs. 12]****UNIT- II**

Asymptotes to Cartesian curves. Radius of curvature and curve tracing for Cartesian, parametric and polar

curves. Integration: integration using reduction formula for  $\int_0^{\pi/2} \sin^n \theta d\theta$ ,  $\int_0^{\pi/2} \cos^n \theta d\theta$ ,

$\int_0^{\pi/2} \sin^n \theta \cos^m \theta d\theta$ . Application of integration : Area under the curve, length of the curve, volumes and surface area of solids of revolution about axis only. Gamma and Beta functions.

**[T1],[T2][No. of hrs. 12]****UNIT- III**

Matrices: Orthogonal matrix, Hermitian matrix, Skew-Hermitian matrix and Unitary matrix. Inverse of matrix by Gauss-Jordan Method (without proof). Rank of matrix by echelon and Normal (canonical) form. Linear dependence and linear independence of vectors. Consistency and inconsistency of linear system of homogeneous and non homogeneous equations. Eigen values and Eigen vectors. Properties of Eigen values (without proof). Cayley-Hamilton theorem (without proof). Diagonalization of matrix. Quadratic form, reduction of quadratic form to canonical form.

**[T1], [T2][No. of hrs. 12]****UNIT-IV**

Ordinary differential equations: First order linear differential equations, Leibnitz and Bernoulli's equation. Exact differential equations, Equations reducible to exact differential equations. Linear differential equation of higher order with constant coefficients, Homogeneous and non homogeneous differential equations reducible to linear differential equations with constant coefficients. Method of variation of parameters. Bessel's and Legendre's equations (without series solutions), Bessel's and Legendre's functions and their properties.

**[T1],[T2][No. of hrs. 12]****Text:**

[T1] B. S. Grewal, "Higher Engineering Mathematics" Khanna Publications.

[T2]. R. K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics" Narosa Publications.

**References:**

[R1] E. kresyzig, "Advance Engineering Mathematics", Wiley publications

[R2] G.Hadley, "Linear Algebra" Narosa Publication

[R3] N.M. Kapoor, "A Text Book of Differential Equations", Pitambar publication.

[R4] Wylie R, "Advance Engineering mathematics", McGraw-Hill

[R5] Schaum's Outline on Linear Algebra, Tata McGraw-Hill

[R6] Polking and Arnold, "Ordinary Differential Equation using MatLab" Pearson.

**APPLIED PHYSICS – I**

**Paper Code: ETPH – 103**  
**Paper: Applied Physics – I**

L	T	C
2	1	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 of 12.5 marks.

*Objective: The objective of the paper is to facilitate the student with the basics of Applied Physics aspects that are required for his understanding of basic physics.*

**UNIT I**

**Interference:** Introduction, Interference due to division of wave front: Fresnel's Biprism, Interference due to division of amplitude: wedge shaped film, Newton's rings.

**Diffraction:** Introduction, Difference between Fresnel and Fraunhofer diffraction, Single slit diffraction, Transmission diffraction grating, Absent spectra.

[T1], [T2](No. of Hrs. 8)

**UNIT II**

**Polarization:** Introduction, Uniaxial crystals, Double refraction, Nicol prism, Quarter and half wave plates, Theory of production of plane, circularly and elliptically polarized lights, Specific rotation, Laurents half shade polarimeter.

**Laser:** Spontaneous and stimulated emissions, Einstein's coefficients, Laser and its principle, He-Ne laser.

**Fibre optics:** Introduction, Single mode fibre, Step index and graded index multimode fibres, Acceptance angle and numerical aperture.

[T1], [T2](No. of Hrs. 8)

**UNIT III**

**Theory of Relativity:** Introduction, Frame of reference, Galilean transformation, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Mass energy relation

**Ultrasonics:** Introduction, Production of ultrasonics by magnetostriction and Piezoelectric methods, Applications.

[T1], [T2](No. of Hrs. 8)

**UNIT IV**

**Nuclear Physics:** Introduction, Radioactivity, Alpha decay, Beta decay, Gamma decay, Q value, Threshold energy, Nuclear reactions, Nuclear fission: Liquid drop model, Nuclear fusion, Particle accelerators: Linear accelerator, Cyclotron, Radiation detectors: Ionization chamber, Geiger Mueller Counter.

[T1](No. of Hrs. 8)

**Text Books:**

- [T1]. Arthur Beiser, 'Concepts of Modern Physics', [McGraw-Hill], 6<sup>th</sup> Edition 2009  
 [T2]. A. S. Vasudeva, 'Modern Engineering Physics', S. Chand, 6<sup>th</sup> Edition, 2013.

**Reference Books**

- [R1]. A. Ghatak 'Optics', TMH, 5<sup>th</sup> Edition, 2013  
 [R2]. G. Aruldas 'Engineering Physics' PHI 1<sup>st</sup> Edition, 2010.  
 [R3]. Fundamentals of Optics : Jenkins and White , Latest Edition  
 [R4]. C. Kittel, "Mechanics", Berkeley Physics Course, Vol.- I.  
 [R5]. Feynman " The Feynman lectures on Physics Pearson Volume 3 Millennium Edition, 2013  
 [R6]. Uma Mukhrji 'Engineering Physics' Narosa, 3<sup>rd</sup> Edition, 2010.  
 [R7]. H.K. Malik & A. K. Singh 'Engineering Physics' [McGraw-Hill], 1<sup>st</sup> Edition, 2009.

**MANUFACTURING PROCESSES**

**Paper Code: ETME-105**

**L      T      C**  
**3      0      3**

**Paper: Manufacturing Processes**

**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.

*Objective: The Objective of the paper is to facilitate the student with the basic Manufacturing processes.*

**Unit-I**

**Introduction:** Introduction of Manufacturing processes and their classification, Basic Metals & Alloys : Properties and Applications. Properties of Materials: Strength, elasticity, stiffness, malleability, ductility, brittleness, toughness and hardness. Ferrous Materials: Carbon steels, its classification based on % carbon as low, mild, medium & high carbon steel, its properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. Elementary introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching & tempering and case- hardening.

Non-Ferrous metals & alloys: Properties and uses of various non-ferrous metals & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin.

**Casting Processes:**

Principles of metal casting, Pattern materials, types and allowance, composition and properties of moulding sand, foundry tools, concept of cores and core print, elements of gating system, description and operation of cupola, special casting processes e.g. die-casting; permanent mould casting; centrifugal casting; investment casting; casting defects.

**(T<sub>1</sub>, T<sub>2</sub>, R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>) [No. of Hrs.12]**

**UNIT-II**

**Smithy and Forging:**

Hot working and cold working, Forging tools and equipments, Forging operations, Forging types: Smith forging, Drop forging, Press forging, Machine forging; Forging defects; Extrusion, wire drawing, swaging.

**BENCH WORK AND FITTING:**

Fitting shop tools, operation: Fitting; sawing; chipping; thread cutting (with taps and dies);

Marking and marking tools.

**(T<sub>1</sub>, T<sub>2</sub>, R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>) [No. of Hrs. 12]**

**Unit-III**

**Metal joining:** Welding principles, classification of welding techniques, Oxyacetylene Gas welding, equipment and field of application, Arc-welding, metal arc, Carbon arc welding, submerged arc welding and atomic hydrogen welding, TIG and MIG welding, Electric resistance welding: spot; seam; flash; butt and percussion welding, Flux: composition; properties and function, Electrodes, Types of joints and edge preparation, Brazing and soldering, welding defects.

**(T<sub>1</sub>, T<sub>2</sub>, R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>)[No. of Hrs. 12]**

**Unit-IV**

**Sheet Metal Work:**

Tools and equipments used in sheet metal work, metals used for sheets, standard specification for sheets, Types of sheet metal operations: shearing, drawing, bending. Other operations like spinning, stretch forming, embossing and coining.

**Powder Metallurgy:** Introduction of powder metallurgy process: powder production, blending, compaction, sintering.

**(T<sub>1</sub>, T<sub>2</sub>, R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>)[No. of Hrs. 12]**

**Text Books:**

[T1]. Manufacturing Process by Raghuvanshi.(Dhanpat Rai and Co.)

[T2]. Manufacturing Technology by P.N.Rao (TMH publications)

**Reference Books:**

[R1]. Workshop Technology by Hazra-Chowdhary (Media Promoters and Publishers Pvt. Ltd.)

[R2]. Production Engineering by R.K.Jain (Khanna Publishers)

[R3]. Workshop Technology by Chapman (Elsevier Butterworth-Heinemann)

[R4]. Fundamentals of Modern Manufacturing by Mikell P. Groover (Wiley India Edition)

[R5]. Manufacturing Processes for Engineering Materials by Kalpakjian and Schmid (Pearson)

**ELECTRICAL TECHNOLOGY****Paper Code: ETEE-107****Paper : Electrical Technology**

L	T	C
3	0	3

**INSTRUCTIONS TO PAPER SETTERS:****Maximum Marks: 75**

1. This is first introductory course in electrical technology to the students of all the branches of engineering in first year.
2. 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.
3. 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.

*Objective: To provide exposure to the students in respects of the basics of different aspects of electrical engineering with emphasis on constructional, measurement and applications of various types of instruments and equipments.*

**UNIT – I: DC Circuits**

Introduction of Circuit parameters and energy sources (Dependent and Independent), Mesh and Nodal Analysis, Superposition, Thevenin's, Norton's, Reciprocity, Maximum Power Transfer and Millman's Theorems, Star-Delta Transformation and their Applications to the Analysis of DC circuits.

**[T1],[T2][No. of Hrs. 11]****UNIT – II: A.C.Circuits**

A.C. Fundamentals, Phasor representation, Steady State Response of Series and Parallel R-L, R-C and R-L-C circuits using j-notation, Series and Parallel resonance of RLC Circuits, Quality factor, Bandwidth, Complex Power, Introduction to balanced 3-phase circuits with Star- Delta Connections.

**[T1],[T2][No. of Hrs. 14]****UNIT – III: Measuring Instruments**

Basics of measuring instruments and their types ,Working principles and applications of moving coil, moving iron (ammeter & voltmeter) and Extension of their ranges, dynamometer- type Wattmeter , induction-type Energy Meter , Two-wattmeter method for the measurement of power in three phase circuits, Introduction to digital voltmeter, digital Multimeter and Electronic Energy Meter.

**[T1],[T2],[R2][No. of Hrs. 11]****UNIT – IV: Transformer and Rotating Machines**

Fundamentals of Magnetic Circuits, Hysteresis and Eddy current losses, working principle, equivalent circuit, efficiency and voltage regulation of single phase transformer and its applications. Introduction to DC and Induction motors (both three phase and single phase), Stepper Motor and Permanent Magnet Brushless DC Motor.

**[T1],[T2],[R2][No. of Hrs. 12]****Text Books:**

[T1] S.N Singh, "Basic Electrical Engineering" PHI India Ed 2012

[T2] Chakrabarti, Chanda,Nath "Basic Electrical Engineering" TMH India", Ed 2012.

**Reference Books:**

[R1] William Hayt "Engineering Circuit Analysis" TMH India Ed 2012

[R2] Giorgio Rizzoni "Principles and Application of Electrical Engineering" Fifth Edition TMH India.

**HUMAN VALUES & PROFESSIONAL ETHICS****Paper Code: ETHS-109**

L	T	C
1	1	1

**Paper : Human Values & Professional Ethics**

Non-University Examination Scheme (NUES)

Note: There will be no End-Term External University Examination. Marks are to be given on the basis of two internal sessional test of 30 marks each and one final Viva-voce project report Examination of 40 marks

**Objectives:**

This introductory course input is intended

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a holistic perspective among students towards life, profession and happiness, based on the correct understanding of the Human reality and the rest of the Existence. Such a Holistic perspective forms the basis of value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

**UNIT-1: Introduction to Value Education****No. of lectures: 03+1**

- Understanding the need, basic guidelines, content and process for value education.
- Basic Human Aspirations: Prosperity and happiness
- Methods to fulfil the human aspirations – understanding and living in harmony at various levels.
- Practice Session – 1.

[T1], [R1], [R4]

**UNIT-2: Harmony in the Human Being****No. of lectures: 05+1**

- Co-existence of the sentient "I" and the material body – understanding their needs – Happiness & Conveniences.
- Understanding the Harmony of "I" with the body – Correct appraisal of physical needs and the meaning of prosperity.
- Programme to ensure harmony of "I" and Body-Mental and Physical health and happiness.
- Harmony in family and society: Understanding Human-human relationship in terms of mutual trust and respect.
- Understanding society and nation as extensions of family and society respectively.
- Practice Session – 02

[T2], [R1], [R2]

**UNIT-3: Basics of Professional Ethics****No. of lectures: 04+1**

- Ethical Human Conduct** – based on acceptance of basic human values.
- Humanistic Constitution and universal human order** – skills, sincerity and fidelity.
- To identify the scope and characteristics of people** – friendly and eco-friendly production system, Technologies and management systems.
- Practice Session – 03.

[T1],[R4]

**UNIT-4: Professional Ethics in practice****No. of lectures: 04+1**

- Profession and Professionalism** – Professional Accountability, Roles of a professional, Ethics and image of profession.
- Engineering Profession and Ethics** - Technology and society, Ethical obligations of Engineering professionals, Roles of Engineers in industry, society, nation and the world.
- Professional Responsibilities** – Collegiality, Loyalty, Confidentiality, Conflict of Interest, Whistle Blowing
- Practice Session – 04

[T1], [T2], [T3], [R3]

**Text Books:**

- [T1] Professional Ethics, R. Subramanian, Oxford University Press.  
 [T2] Professional Ethics & Human Values: S.B. Srivastha, SciTech Publications (India) Pvt. Ltd. New Delhi.  
 [T3] Professional Ethics & Human Values: Prof. D.R. Kiran, TATA Mc Graw Hill Education.

**References:**

- [R1] Success Secrets for Engineering Students: Prof. K.V. SubbaRaju, Ph.D., Published by SMARTstudent.

Modified Scheme and Syllabus of B. Tech-CIVIL Engg. (1<sup>st</sup> Semester to 8<sup>th</sup> Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23<sup>rd</sup> BOS and 40<sup>th</sup> AC meeting of USET.

- [R2] Ethics in Engineering Mike W. Martin, Department of Philosophy, Chapman University and Roland Schinzing, School of Engineering, University of California, Irvine.
- [R3] Human Values: A. N. Tripathy (2003, New Age International Publishers)
- [R4] Value Education website, <http://www.universalhumanvalues.info>[16]
- [R5] Fundamentals of Ethics, Edmond G. Seebauer & Robert L. Barry, Oxford University Press.
- [R6] Human Values and Professional Ethics: R. R. Gaur, R. Sangal and G. P. Bagaria, Eecel Books (2010, New Delhi). Also, the Teachers' Manual by the same author.

**\*PRACTICAL SESSIONS OF 14 HOME ASSIGNMENTS** will be followed by the students pursuing this paper. (Ref: Professional Ethics & Human Values: S.B. Srivastava, SciTech Publications (India) Pvt. Ltd. New Delhi. )

### CONTENT OF PRACTICE SESSION

#### **Module 1: Course Introduction – Needs, Basic Guidelines, Content and Process of Value Education**

**PS-1:** Imagine yourself in detail. What are the goals of your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcoming in your life? Observe and analyze them.

##### **Expected Outcome:**

The students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

**PS-2:** Now a days there is lot of voice about techno-genie maladies such as energy and natural resource depletion, environmental Pollution, Global Warming, Ozone depletion, Deforestation, etc. – all these scenes are man-made problems threatening the survival of life on the earth – what is root cause of these maladies and what is the way out in your opinion?

On the other hand there is rapidly growing danger because of nuclear proliferation, arm race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression and suicidal attempts, etc - what do you think the root cause of these threats to human happiness and peace – what could be the way out in your opinion?

##### **Expected Outcome:**

The students start finding out that technical education with study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of all the problems and the sustained solution could emerge only through understanding of human values and value based living. Any solutions brought out through fear, temptation or dogma will not be sustainable.

**PS-3:** 1. Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of following:

- a) What is naturally acceptable to you in relationship – feeling of respect or disrespect?
- b) What is naturally acceptable to you - to nurture or to exploit others? Is your living the same as your natural acceptance or different?

2. Out of three basic requirements for fulfillment of your aspirations, right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time and efforts you devote for each in your daily routine.

##### **Expected Outcome:**

1. The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify the right or wrong, and referring to any external source life text or instrument or any other person cannot enable them to verify with authenticity, it will only develop assumptions.
2. The students are able to see that their practice in living is not in harmony with their natural acceptance at most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.
3. The students are able to see that lack of right understanding leading to lack of relationship is the



major cause of the problems in their family and the lack of physical facilities in most of the cases; while they have given higher priority to earning of physical facilities in their life ignoring relationship and not being aware that right understanding is the most important requirement for any human being.

## Module 2: Understanding harmony in human being – Harmony in myself!

**PS-4:** Prepare the list of your desires. Observe whether the desires are related with self “I” or body. If it appears to be related with the both, see which part of it is related to self “I” and which part is related to body.

### Expected Outcome:

The students are able to see that they can enlist their desires and the desires are not vague, also they are able to relate their desires to “I” and “body” distinctly. If, any desire appears to be related with both, they are able to see that feeling is related to “I” while the physical facility is related to the body. They are also able to see that “I” and “body” are two realities, and most of their desires are related to “I” and not with the “Body”; while their efforts are mostly connected on the fulfillment of the need of the body assuming that it will meet the needs of “I” too.

### PS-5:

1. {A}. Observe that any physical facilities you use, follows the given sequence with time; Necessary and tasteful – unnecessary & tasteful – unnecessary & tasteless.
- {B}. In contrast, observe that any feelings in you are either naturally acceptable or not acceptable at all. If, naturally acceptable, you want it continuously and if not acceptable, you do not want it at any moment.
2. List Down all your activities. Observe whether the activity is of “I” or of “body” or with the participation both “I” and “body”.
3. Observe the activities with “I”. Identify the object of your attention for different moments (over a period say 5 to 10 minute) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

### Expected Outcome:

1. The students are able to see that all physical facilities they use are required for limited time in a limited quantity. Also they are able to see that cause of feeling, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable eve for a single moment.
2. The students are able to see that activities like understanding, desires, thoughts and selection are the activities of “I” only; the activities like breathing, palpitation of different parts of the body are fully the activities of the body. With the acceptance of “I”, while activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs, etc. are such activities that require the participation of both “I” and “body”
3. The students become aware of their activities of “I” and start finding their focus of attention at different moments. Also they are able see that most of their desires are coming from outsides (through preconditioning or sensation) and are not based on their natural acceptance.

- PS-6:**
1. Chalk out the program to ensure that you are responsible to your body – for the nurturing, protection and right utilization of the body.
  2. Find out the plants and shrubs growing in and your campus. Find out their use for curing different diseases.

### Expected Outcome:

The students are able to list down activities related to a proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing the different diseases.

## Module 3: Understanding harmony in the family and society - Harmony in Human – Human relationship

**PS-7:** Form small groups in the class and in that group initiate the dialogue and ask the eight questions related to trust. The eight questions are-

S.No.	Intention (Natural Acceptance)	S.No.	Competence
1.a.	Do I want to make myself happy?	1.b.	Am I liable to make myself always Happy?
2.a.	Do I want to make the other happy?	2.b.	Am I liable to make the other always happy?
3.a.	Does the other want to make him happy?	3.b.	Is the other able to make him always happy?
4.a.	Does the other want to make me happy? What is answer?	4.b.	Is the other able to make me always happy? What is answer?

Let each student answer the question for himself and everyone else. Discuss the difference between intention and competence.

**Expected Outcome:**

The students are able to see that the first four questions are related to our natural acceptance i.e. intention and the next four to our competence. They are able to note that the intention is always correct, only competence is lacking. We generally evaluate ourselves on the basis of our intention and other on the basis of their competence. We seldom look at our competence and other's intention as a result we conclude that I am a good person and other is a bad person.

**PS-8:**

1. Observe that on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasion you are disrespecting by way of under evaluation, over evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

**Expected Outcome:**

The students are able to see that respect is right evaluation and only right evaluation leads to fulfilment of relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect) like gender biasness, generation gap, caste conflicts, class struggle, and domination through poor play, communal violence, and clash of isms and so on so forth.

All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

**PS-9:**

1. Write a note in the form of a story, poem, skit, essay, narration, dialogue, to educate a child. Evaluate it in a group.
2. Develop three chapters to introduce "social science", its needs, scope and content in the primary education of children.

**Expected Outcome:**

The students are able to use their creativity for educating children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

**Module 4: Understanding harmony in the nature and existence – Whole existence as Co – existence -**

**PS-10:** Prepare the list of units (things) around you. Classify them into four orders. Observe and explain the mutual fulfilment of each unit with other orders.

**Expected Outcome:**

The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them. They are also able to see that human beings are not fulfilling to their orders today and need to take appropriate steps to ensure right participation (in term of nurturing, protection and right utilization) in the nature.

**PS-11:**

1. Make a chart for the whole existence. List down different courses of studies and relate them to different or levels in the existence.
2. Choose any one subject being taught today. Evaluate and suggest suitable modifications to make it appropriate and holistic.

**Expected Outcome:**

The students are confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are liable to make out how these courses can be made appropriate and holistic.

**Module 5: Implication of the above Holistic Understanding of Harmony at all Levels of Existence.**

**PS-12:** Choose any two current problem of different kind in the society and suggest how they can be solved on the basis of the natural acceptance of human values. Suggest the steps you will take in present conditions.

**Expected Outcome:**

The students are liable to present sustainable solutions to the problem in society and nature. They are also able to see that these solutions are practicable and draw road maps to achieve them.

**PS-13:**

1. Suggest ways in which you can use your knowledge of engineering / technology / management for universal human order from your family to world family.
2. Suggest one format of humanistic constitution at the level of nation from your side.

**Expected Outcome:**

The students are able to grasp the right utilization of their knowledge in their streams of technology / engineering / management to ensure mutually enriching and recyclable production systems.

**PS-14:** The course is going to be over now. Evaluate your state before and after the course in terms of-

- Thoughts
- Behavior
- Work and
- Realization

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

**Expected Outcome:**

The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for happy and prosperous society.

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**FUNDAMENTALS OF COMPUTING****Paper Code: ETCS-111****Paper: Fundamentals of Computing**

L	T	C
2	0	2

**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 10 marks

*Objective: The objective of the paper is to facilitate the student with applied working knowledge of computers. This is the first course of computing and does not assume any pre-requisite.*

**UNIT-I**

Five Component Model of a Computer, System and Application software ( introduction ) storage devices , primary (RAM, ROM, PROM, EPROM, cache ) Memory and secondary (magnetic tape, hard disk, Compact disks) memory , peripheral devices , printers.

[T1], [T2][8 Hours]

**UNIT-II**

Operating Systems: DOS Internal, External commands, Windows ( 2000 and NT) , Overview of architecture of Windows, tools and system utilities including registry , partitioning of hard disk , Overview of Linux architecture , File system , file and permissions , concept of user and group , installation of rpm and deb based packages.

[T1], [T2][8 Hours]

**UNIT-III**

Basics of programming through flow chart , Networking Basics - Uses of a network and Common types of networks , Network topologies and protocols , Network media and hardware , Overview of Database Management System.

[T1],[T2],[R1][8 Hours]

**UNIT-IV**

Libre / Open Office Writer : Editing and Reviewing, Drawing, Tables, Graphs, Templates

Libre / Open Office Calc : Worksheet Management , Formulas, Functions, Charts

Libre / Open Office Impress: designing powerful power-point presentation

[R2][R3] [8 Hours]

**Text:**

[T1] Peter Norton, Introduction to computers, Sixth Edition Tata McGraw Hill (2007).

[T2] Andrews Jean, A+Guide to Managing &amp; Maintaining Your PC, Cengage Publication 6/e

**References:**

[R1] Anita Goel, Computer Fundamentals, Pearson Education.

[R2] Joiner Associates Staff, Flowcharts: Plain &amp; Simple: Learning &amp; Application Guide , Oriel Inc

[R3] <http://www.openoffice.org/why/>[R4] <http://www.libreoffice.org/get-help/documentation/>

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**APPLIED CHEMISTRY**

**Paper Code: ETCH – 113**  
**Paper : Applied Chemistry**

<b>L</b>	<b>T</b>	<b>C</b>
<b>2</b>	<b>1</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. Each 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.

*Objective: The objective of the paper is to facilitate the student with the basics of Applied Chemistry aspects that are required for his understanding of basic chemistry*

**UNIT I: FUELS**

Definition, Classification & Calorific value of fuels (gross and net), Dulong's formula (**Numericals**), Determination of calorific value of fuels using bomb's calorimeter (**Numericals**), Determination of calorific value of fuels using Boy's Gas Calorimeter (**Numericals**), Cracking – Thermal & catalytic cracking, Octane & Cetane numbers with their significance. High & Low temperature carbonization, Manufacture of coke (Otto – Hoffmann oven) Proximate and ultimate analysis of Coal (**Numericals**) Combustion of fuels (**Numericals**).

**[T1,T2][No. of hrs. 08]****UNIT II: THE PHASE RULE & CATALYSIS**

Definition of various terms, Gibb's Phase rule & its derivation, Application of phase rule to One component system- The water system, Application of phase rule to Two component system- The Lead-Silver system (Pattinson's process).

Catalyst and its characteristics, Types of catalysts, Concept of promoters, inhibitors and poisons. Theories of catalysis: Intermediate compound formation theory, adsorption or contact theory. Application of catalysts for industrially important processes Enzyme catalysis: Characteristics, Kinetics & Mechanism of enzyme catalysed reaction ( Michaelis-Menten equation), Acid-Base catalysis: Types, Kinetics & Mechanism, Catalysis by metals salts (Wilkinson's Catalyst), Auto-catalysis, Heterogeneous catalysis (Langmuir-Hinshelwood mechanism).

**[T1,T2][No. of hrs. 08]****UNIT III: WATER**

Introduction and specifications of water , Hardness and its determination by EDTA method (**Numericals**), Alkalinity and its determination (**Numericals**), Reverse Osmosis, Electrodialysis, Disinfection by break-point chlorination. Boiler feed water, boiler problems– scale, sludge, priming & foaming: causes & prevention, Boiler problems– caustic embrittlement & corrosion: causes & prevention, Water Softening by Internal Treatment: carbonate & phosphate conditioning, colloidal conditioning & calgon treatment Water Softening by External Treatment: Lime-Soda Process (**Numericals**) Zeolite & Ion-Exchange Process.

**[T1,T2][No. of hrs. 08]****UNIT IV: CORROSION & ITS CONTROL**

Causes, effects & consequences; Chemical or Dry corrosion & its mechanism (Pilling-Bedworth Rule) Electrochemical or Wet Corrosion & Its mechanism, Rusting of Iron Passivity, Galvanic series, Galvanic Corrosion, Soil Corrosion Pitting Corrosion, Concentration Cell or Differential Aeration Corrosion, Stress Corrosion. Factors Influencing Corrosion: Nature of metal and nature of corroding environment; Protective measures: Galvanization, Tinning Cathodic Protection, Sacrificial Anodic protection, Electroplating, Electroless plating, Prevention of Corrosion by Material selection & Design.

**[T1,T2][No. of hrs. 08]****Text Books:**

- [T1] P. C. Jain & Monika Jain, *Engineering Chemistry*, Latest edition, Dhanpat Rai Publishing Co., 2002.  
 [T2] P. Mathew, *Advance Chemistry*, 1 & 2 Combined Editions, Cambridge University Press, 2003.

**Reference Books:**

- [R1] P. W. Atkins and J. De Paula, *Atkins' Physical Chemistry*, Oxford, 2010.  
 [R2] T. Engel and P. Reid, *Physical Chemistry*, Pearson Education, 2013.  
 [R3] K. Qanungo, *Engineering Chemistry*, PHI Learning Private Limited, New Delhi, 2009.  
 [R4] O. G. Palanna, *Engineering Chemistry*, Tata McGraw Hill Education Private Limited, 2012.  
 [R5] D. A. Jones, *Principles and Prevention of Corrosion*, Prentice Hall, 2<sup>nd</sup> Edition, 1996.  
 [R6] H. K. Chopra and A. Parmar, *Engineering Chemistry- A Text Book*, Narosa Publishing House, 2012.  
 [R7] S. Chawla, *Engineering Chemistry-All India Edition*, Dhanpat Rai & Co., 2003.  
 [R8] R. Gadi, S. Rattan and S. Mohapatra, *Environmental Studies*, S.K. Kataria & Sons, 2<sup>nd</sup> Edition 2009.

**APPLIED PHYSICS LAB – I****Paper Code: ETPH-151****Paper : Applied Physics Lab – I****P****2****C****1****LIST OF EXPERIMENTS**

1. To determine the wavelength of sodium light by Newton's Rings.
2. To determine the wavelength of sodium light by Fresnel's biprism.
3. To determine the wavelength of sodium light using diffraction grating.
4. To determine the refractive index of a prism using spectrometer.
5. To determine the dispersive power of prism using spectrometer and mercury source.
6. To determine the specific rotation of cane sugar solution with the help of half shade polarimeter.
7. To find the wavelength of He-Ne laser using transmission diffraction grating.
8. To determine the numeral aperture (NA) of an optical fibre.
9. To plot a graph between the distance of the knife-edge from the center of the gravity and the time period of bar pendulum. From the graph, find
  - (a) The acceleration due to gravity
  - (b) The radius of gyration and the moment of inertia of the bar about an axis.
10. To determine the velocity of ultrasound waves using an ultrasonic spectrometer in a given liquid (Kerosene Oil).
11. To verify inverse square law.
12. To determine Planck's constant.

**Text Books:**

[T1] C. L. Arora 'B. Sc. Practical Physics' S. Chand

**Note:** Any 8-10 experiments out of the list may be chosen. Proper error – analysis must be carried out with all the experiments.



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**ELECTRICAL TECHNOLOGY LAB****Paper Code: ETEE 153****Paper: Electrical Technology Lab**

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

**LIST OF EXPERIMENTS**

1. To Design the circuit for a given load and selection of its various Components and instruments from the safety point of view
2. Study and applications of CRO for measurement of voltage, frequency and phase of signals.
3. Connection of lamp by  
(1) Single Switch Method. (2) Two-way Switch Method.  
OR  
Performance comparison of fluorescent Tube & CFL Lamp.
4. To Verify Thevenin's & Norton's Theorem  
OR  
To Verify Superposition & Reciprocity Theorem.  
OR  
To Verify Maximum Power Transfer Theorem.
5. To Measure Power & Power Factor in a Single-Phase A.C Circuit using Three Ammeters or three Voltmeters.
6. To Measure Power & Power Factor in a Balanced Three Phase Circuit using Two Single Phase Wattmeters.
7. To study of Resonance in a series R-L-C or Parallel R-L-C Circuits.
8. To perform open circuit and short circuit test on 1-phase transformer.
9. Starting, Reversing and speed control of DC shunt Motor
10. Starting, Reversing and speed control of 3-phase Induction Motor
11. To Study different types of Storage Batteries & its charging system.
12. To Study different types of earthing methods including earth leakage circuit breaker (GFCI)

**Note:- Any 8-10 Experiments out of the list may be chosen.**


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**WORKSHOP PRACTICE**

**Paper Code: ETME-155**  
**Paper: Workshop Practice**

L	P	C
0	3	2

**LIST OF EXPERIMENTS*****Sheet Metal Shop***

1. To study the tools and machineries used in sheet metal shop.
2. To make a tray using sheet metal tools.
3. To make a Funnel using sheet metal tools.
4. To make a cylindrical mug in sheet metal shop.

***Foundry Shop***

5. To make a mould in Foundry Shop.

***Carpentry Shop***

6. To make a half lap T-joint in Carpentry Shop.
7. To make a half cross lap joint in Carpentry Shop.
8. To make a pattern using Carpentry Tools.

***Welding Shop***

9. To study arc and gas welding equipments and tools.
10. To make Lap Joint, T-Joint and Butt Joint in Welding shop.

***Fitting Shop***

11. To make V-Section and T-Slot in fitting shop.

***Machine Shop***

12. To study basic operations on lathe, shaper, milling, drilling and grinding machines..
13. To perform step turning, knurling and threading operations on lathe.
14. To prepare a simple job on shaper.

**Note:- Any 8-10 Experiments out of the list may be chosen.**





**ENGINEERING GRAPHICS**

Paper Code: ETME-157

Paper: Engineering Graphics Lab

L	P	C
0	3	2

**LIST OF EXPERIMENTS****UNIT - I**

**General:** Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications,

**Projections of Point and Lines:** Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.

(T<sub>1</sub>, T<sub>2</sub>, R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>)**Unit - II**

**Planes other than the Reference Planes:** Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.

**Projections of Plane Figures:** Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection.

(T<sub>1</sub>, T<sub>2</sub>, R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>)**Unit - III**

**Projection of Solids:** Simple cases when solid are placed in different positions, Axis faces and lines lying in the faces of the solid making given angles.

(T<sub>1</sub>, T<sub>2</sub>, R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>)**Unit-IV****Isometric Projection of plain surface and bodies.**(T<sub>1</sub>, T<sub>2</sub>, R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>)**Text Books:**

[T1] Engineering drawing by N.D.Bhatt (Charotar Publications).

[T2] Engineering Drawing by S.C.Sharma &amp; Navin Kumar (Galgotia Publications)

**Reference Books:**

[R1] Engineering Drawing by Venugopalan, (New Age International).

[R2] **Engineering Drawing by P.S.Gill (S.K. Kataria & Sons)**

[R3] Engineering Graphics by K.C.John (PHI)

**Note:- Any 8-10 Experiments out of the list may be chosen.**

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**FUNDAMENTAL OF COMPUTING LAB****Paper Code: ETCS 157**

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

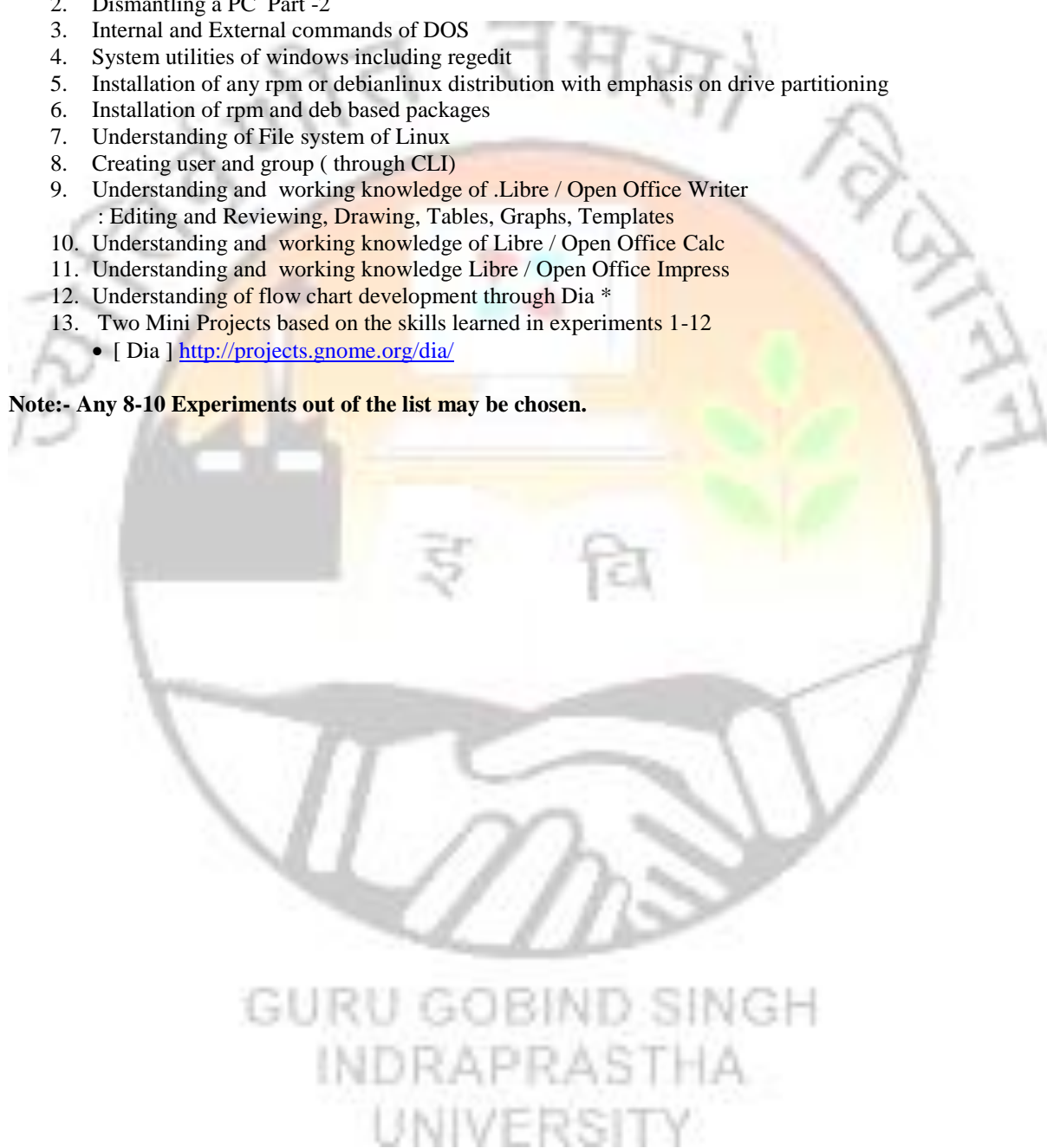
**Paper: Fundamental of Computing Lab****LIST OF EXPERIMENTS**

For program development an IDE e.g. CodeBlock<sup>[a]</sup>, Eclipse CDT<sup>[b]</sup>, Netbeans<sup>[c]</sup> is recommended

1. Dismantling a PC Part -1
2. Dismantling a PC Part -2
3. Internal and External commands of DOS
4. System utilities of windows including regedit
5. Installation of any rpm or debianlinux distribution with emphasis on drive partitioning
6. Installation of rpm and deb based packages
7. Understanding of File system of Linux
8. Creating user and group ( through CLI)
9. Understanding and working knowledge of .Libre / Open Office Writer  
: Editing and Reviewing, Drawing, Tables, Graphs, Templates
10. Understanding and working knowledge of Libre / Open Office Calc
11. Understanding and working knowledge Libre / Open Office Impress
12. Understanding of flow chart development through Dia \*
13. Two Mini Projects based on the skills learned in experiments 1-12

- [ Dia ] <http://projects.gnome.org/dia/>

**Note:- Any 8-10 Experiments out of the list may be chosen.**



**APPLIED CHEMISTRY LAB**

Paper Code –ETCH-161

**P****C**

Paper : Applied Chemistry Lab

**2****1****LIST OF EXPERIMENTS**

1. Determination of alkalinity of water sample.
2. Determination of hardness of water sample by EDTA method.
3. Determine the percentage composition of sodium hydroxide in the given mixture of sodium hydroxide and sodium chloride.
4. Determine the amount of oxalic acid and Sulphuric acid in one litre of solution, given standard sodium hydroxide and Potassium Permanganate.
5. Determine the amount of copper in the copper ore solution, provided hypo-solution (Iodometric Titration).
6. Determine the amount of chloride ions present in water using silver nitrate (Mohr's Precipitation Method).
7. Determine the strength of  $MgSO_4$  solution by Complexometric titration.
8. Determine the surface tension of a liquid using drop number method.
9. Determine the viscosity of a given liquid (density to be determined).
10. Determine the cell constant of conductivity cell and titration of strong acid/strong base conductometrically.
11. To determine (a)  $\lambda_{max}$  of the solution of  $KMnO_4$ . (b) Verify Beer's law and find out the concentration of unknown solution by spectrophotometer.
12. Determination of the concentration of iron in water sample by using spectrophotometer.
13. Determination of the concentration of Iron (III) by complexometric titration.
14. Proximate analysis of coal.
15. Determination of eutectic point and congruent melting point for a two component system by method of cooling curve.  
(At least 8 to 10 experiments are to be performed)

**Suggested Books:**

1. [A. I. Vogel](#), [G. H. Jeffery](#), *Vogel's Text Book of Quantitative Chemical Analysis*, Published by Longman Scientific & Technical, 5<sup>th</sup> Edition, 1989.
2. S. Chawla, *Essentials of Experimental Engineering Chemistry*, Dhanpat Rai & Co., 3<sup>rd</sup> Edition, 2008.
3. S. Rattan, *Experiments in Applied Chemistry*, Published by S.K.Kataria & Sons, 2<sup>nd</sup> Edition, 2003.
4. O. P. Pandey, D. N. Bajpai and S. Giri, *Practical Chemistry*, Published by S. Chand, 2005.
5. M. S. Kaurav, *Engineering Chemistry with Laboratory Experiments*, Published by PHI Learning Private Limited, 2011.
6. S. K. Bhasin and Sudha Rani, *Laboratory Manual on Engineering Chemistry*, Published by Dhanpat Rai Publishing Company, 2006.

**Note:- Any 8-10 Experiments out of the list may be chosen.**

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**APPLIED MATHEMATICS-II****Paper Code : ETMA-102****Paper: APPLIED MATHEMATICS-II**

<b>L</b>	<b>T</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: The objective of the paper is to facilitate the student with the basics of Applied Mathematics that are required for an engineering student.*

**Unit –I**

Partial differentiation and its Applications: Partial derivatives of first and second order. Euler's theorem for homogeneous functions (without proof). Derivatives of Implicit Functions, total derivatives. Change of variables. Jacobian. Taylor's theorem for function of two variables (without proof). Error and approximation. Extreme values of function of several variables (maxima, minima, saddle points). Lagrange method of undetermined multipliers. Partial differential equations: Formulation, solution of first order equations, Lagrange's equations, Charpit's method.

**[T2][No. of 12hrs.]****Unit-II**

Laplace Transformation: Definition, Laplace transformation of basic functions, existence condition for Laplace transformation, Properties of Laplace transformation (Linearity, scaling and shifting). Unit step function, Impulse Function, Periodic Functions. Laplace transformation of derivatives, Laplace transformation of integrals, differentiation of transforms, Integration of transforms, Convolution theorem, inverse Laplace transformation. Solution of ordinary Differential equations.

**[T1, T2][No. of 12hrs.]****Unit-III**

Complex Function: Definition, Derivatives, Analytic function, Cauchy's Riemann equation (without proof). Conformal and bilinear mappings, Complex Integration: Complex Line integration, Cauchy's integral theorem and integral formula (without proof). Zeros and Singularities, Taylor's and Laurent's series (without proof). Residues, Residue theorem (without proof). Evaluation of real definite integrals: Integration around the unit circle, Integration around a small semi circle and integration around rectangular contours.

**[T1, T2][No. of 12hrs.]****Unit-IV**

Multiple integrals: Double integrals, Change of order of integration, Triple integrals. Vector Calculus: Scalar and vector functions, Gradient, Divergence and curl. Directional derivatives, Line Integrals. Surface integrals, volume integrals. Green's theorem, Stoke's theorem and Gauss divergence theorem (without proof).

**[T1, T2][No. of 12hrs.]****Text:**

[T1]. E. kresyzig, "Advance Engineering Mathematics", Wiley publications

[T2] Michael Greenberg, "Advance Engineering mathematics", Pearson.

**References:**

[R1] R.K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics" Narosa Publications

[R2] B. S. Grewal, "Higher Engineering Mathematics" Khanna Publications.

[R3] S. Ponnusamy, "Foundation of Complex Analysis" Narosa Publication

[R4] G.B. Thomas and R. N. Finny "Calculus and Analytic Geometry" Addison Wesley/ Narosa

[R5] Wylie R, "Advance Engineering mathematics", McGraw-Hill

[R6] M. Spiegel, "Schaum's Outline on Laplace Transform, Tata McGraw-Hill

**APPLIED PHYSICS – II****Paper Code: ETPH-104****Paper : APPLIED PHYSICS – II**

<b>L</b>	<b>T</b>	<b>C</b>
<b>2</b>	<b>1</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 of 12.5 marks.

*Objective: The objective of the paper is to facilitate the student with the basics of Applied Physics aspects that are required for his understanding of basic physics.*

**UNIT I**

**Electromagnetic Theory :** Gradient, Divergence, Curl, Gauss' law, Ampere's Law, Continuity equation, Maxwell's equations (differential and integral forms), Significance of Maxwell's equations, Poynting Theorem, Electromagnetic wave propagation in dielectrics and conductors.

**[T1], [T2][No. of Hrs. 8]****UNIT II**

**Statistical Physics:** Black body radiation, Planck's radiation formula, Wien's and Rayleigh-Jeans Laws, Distribution laws: Qualitative features of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics & their comparison (without derivation).

**Quantum Mechanics:** Postulates of Quantum mechanics, de-Broglie hypothesis, Davisson Germer experiment, Wave function and its physical significance, Wave Packet, Phase and group velocities, Uncertainty principle, Schrodinger equation for free particle, Time dependent Schrodinger equation, Particle in a box (1-D).

**[T1][T2][No. of Hrs. 8]****UNIT III**

**Crystal Structure:** Types of solids, Unit cell, Types of crystals, Translation vectors, Lattice planes, Miller indices, Simple crystal structures, Interplaner spacing, Crystal structure analysis: Bragg's law, Laue method, Point defects: Schottky and Frankel defects.

**[T1], [T2][No. of Hrs. 8]****UNIT IV**

**Band Theory of Solids:** Introduction, Kronig-Penney model: E-k diagram, Effective mass of an electron, Intrinsic semiconductors: Electron concentration in conduction band, Hole concentration in valence band, Extrinsic semiconductor: p-type and n-type semiconductors, Fermi level, Hall Effect: Hall voltage and Hall coefficient.

**[T1][T2][No. of Hrs. 8]****Text Books:**

[T1]. Arthur Beiser 'Concepts of Modern Physics', [McGraw-Hill], 6<sup>th</sup> Edition 2009.

[T2]. A. S.Vasudeva, 'Modern Engineering Physics', S. Chand, 6<sup>th</sup> Edition, 2013.

**Reference Books**

[R1]. Richard Wolfson 'Essential University Physics' Pearson, 1st edition, 2009.

[R2]. H.K. Malik & A. K. Singh 'Engineering Physics' [McGraw-Hill], 1<sup>st</sup> Edition, 2009.

[R3]. C. Kittle, 'Mechanics', Berkeley Physics Course, Vol. - I. Latest Edition.

[R4]. Irving Kaplan 'Nuclear Physics' Latest Edition.

[R5]. John R. Taylor, Chris D. Zafirator and Michael A. Dubson, 'Modern Physics For Scientists and Engineers', PHI, 2<sup>nd</sup> Edition.

[R6]. D.J. Griffith, 'Introduction to Electrodynamics', Prentice Hall, Latest Edition.

**ELECTRONIC DEVICES**

**Paper Code: ETEC-106**  
**Paper : Electronic Devices**

L	T	C
3	0	3

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

1. This is the first introductory course in Electronics Engineering to the students of all the branches of engineering during the first year.
2. Question No.1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions from each unit. It should be of 25 marks.
3. 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.

*Objective: Objective of the paper is to facilitate the student with the basics of electronic aspects that are required for his understanding and applications in their respective field of study. The pre-requisites are, to have a basic understanding of Applied Physics and Mathematics.*

**Unit-I**

**Evaluation Of Electronics:** Introduction & Application Of Electronics, Energy Band Theory Of Crystals, Energy Band Structures In Metals, Semiconductors And Insulators, Theory Of Semiconductors: Classification Of Semiconductors, Conductivity Of Semiconductors, Carrier Concentration In Intrinsic & Extrinsic Semiconductors, Properties Of Intrinsic And Extrinsic Semiconductors, Variation In Semiconductors Parameters With Temperature, Fermi-Dirac Function, Fermi Level In A Semiconductor Having Impurities, Band Structure Of Open-Circuited P-N Junction, Drift And Diffusion Currents, Carrier Life Time, Continuity Equation (Elementary Treatment Only)

[T1][T2][T3][No. Of Hours: 12]

**Unit – II**

**Theory of p-n junction Diode:** Diode Current Equation, Diode Resistance, Transition Capacitance, Diffusion Capacitance, (Elementary treatment only), Effect of Temperature on p-n Junction Diode, Switching Characteristics, Piecewise Linear Model, **Special Diodes:** Zener Diode, Varactor Diode, Tunnel Diode, Photodiode, Light Emitting Diodes, Schottky Barrier Diode, **Applications of Diodes:** Half-Wave Diode Rectifier, Full-Wave Rectifier, Clippers and Clampers (Elementary treatment only).

[T1][T2][T3][No. of Hours: 11]

**Unit – III**

**Bipolar junction transistor:** Introduction of transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations, Eber-moll's model.

[T1][T2][T3][No. of Hours: 11]

**Unit – IV**

**Application of BJT:** CB, CE, CC configurations, hybrid model for transistor at low frequencies, Introduction to FETs and MOSFETs.

**Fundamentals of digital electronics:** Digital and analog signals, number systems, Boolean algebra, logic gates with simple applications, logic gates, karnaugh maps.

[T1][T2][T3][No. of Hours: 11]

**Text Books**

- [T1] S. Salivahanan, N. Suresh Kr. & A. Vallavaraj, "Electronic Devices & Circuit", Tata McGraw Hill, 2008
- [T2] Millman, Halkias and Jit, "Electronic devices and circuits" McGraw Hill
- [T3] Boylestad & Nashelsky, "Electronic Devices & Circuits", Pearson Education, 10<sup>TH</sup> Edition.

**Reference Books**

- [R1] Sedra & Smith, "Micro Electronic Circuits" Oxford University Press, VI Edition
- [R2] Robert T. Paynter, "Introducing Electronic Devices & Circuits", Pearson Education, VII Edition, 2006

**INTRODUCTION TO PROGRAMMING**

**Paper Code: ETCS-108**

**Paper: Introduction to Programming**

<b>L</b>	<b>T</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: The objective of the paper is to facilitate the student with the basics of programming aspects, using C as the primary language. This course focuses on the programming constructs which are used in other languages as well. This is the first course on programming and does not assume any prerequisite.*

**UNIT I**

Concept of algorithms, Flow Charts, Overview of the compiler ( preferably GCC ) , Assembler, linker and loader , Structure of a simple Hello World Program in C ,Overview of compilation and execution process in an IDE ( preferably Code Block)

[T1],[T2], [R4][R5][No. of hrs 8]

**UNIT II**

Programming using C: Preprocessor Directive, C primitive input output using get char and put char , simple I/O Function calls from library , data type in C including enumeration , arithmetic, relational and logical operations, conditional executing using if, else, switch and break .Concept of loops , for, while and do-while , Storage Classes: Auto, Register, Static and Extern

[T1], [T2], [R7][No. of hrs 8]

**UNIT III**

Arrays (one and two dimensional), 2-d arrays used in matrix computation. Concept of Sub-programming, functions. Parameter transmission schemes i.e. call by value and call by reference, Pointers, relationship between array and pointer, Argument passing using pointers, Array of pointer, passing arrays as arguments

[T2], [R1], [R7][No. of hrs 8]

**UNIT IV**

Structure and unions , Strings and C string library, File Handling in C Using File Pointers,fopen( ), fclose( ),Input and Output using file pointers, Character Input and Output with Files , String Input / Output Functions , Formatted Input / Output Functions,Block Input / Output Functions, Sequential Vs Random Access Files , Positioning the File Pointer

[T1], [T2],[R2][R7][No. of hrs 8]

**Text Books:**

- [T1] Herbert Schildt, "C: The Complete Reference", OsbourneMcgraw Hill, 4th Edition, 2002.  
 [T2] Forouzan Behrouz A. "Computer Science: A Structured Programming Approach Using C, Cengage Learning 2/e

**Reference Books:**

- [R1] Kernighan & Ritchie, "C Programming Language", The (Ansi C version), PHI, 2/e  
 [R2] K.R Venugopal, "Mastering C ", TMH  
 [R3] R.S. Salaria "Application Programming in C " Khanna Publishers4/e  
 [R4] Yashwant Kanetkar " Test your C Skills ", BPB Publications  
 [R5] <http://www.codeblocks.org/>  
 [R6] <http://gcc.gnu.org/>  
 [R7] Programming in ANSI C, E. Balagurusamy; Mc Graw Hill, 6<sup>th</sup> Edition.

**ENGINEERING MECHANICS**

**Paper Code: ETME 110**  
**Paper: Engineering Mechanics**

<b>L</b>	<b>T</b>	<b>C</b>
<b>2</b>	<b>1</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 of 12.5 marks.

**OBJECTIVE: THE OBJECTIVE OF THE PAPER IS TO GIVE THE BASIC PRINCIPLES OF MECHANIC APPLIED IN DIFFERENT DISCIPLINES OF ENGINEERING.**

**UNIT- I**

**Force system:** Free body diagram, Parallel force system, concurrent force system, Equilibrium equations and applications in different force systems.

**Friction:** Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, Belt drive- derivation of equation  $T_1/T_2 = e^{\mu\theta}$  and its application, M.A, V.R and Efficiency of Screw Jack, Application of friction in pivot and collar bearing..

[T1, T2, R1, R2, R4, R5][No. of Hrs. 08]

**UNIT- II**

**Structure:** Plane truss, perfect and imperfect truss, assumption in the truss analysis, analysis of perfect plane trusses by the method of joints, method of section, graphical method.

**Distributed Force:** Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, mass moment of inertia and area moment of inertia by direct integration and composite bodies method, radius of gyration, parallel axis theorem, Pappus theorems, polar moment of inertia.

[T1, T2, R1, R2, R4, R5][No. of Hrs. 08]

**Unit-III**

**Kinematics of Particles:** Rectilinear motion, plane curvilinear motion-rectangular coordinates, normal and tangential component.

**Kinetics of Particles:** Equation of motion, rectilinear motion and curvilinear motion, work energy equation, conservation of energy, impulse and momentum, conservation of momentum, impact of bodies, co-efficient of restitution, loss of energy during impact.

[T1, T2, R1, R2, R4, R5][No. of Hrs. 08]

**Unit-IV**

**Kinematics of Rigid Bodies:** Concept of rigid body, type of rigid body motion, absolute motion, introduction to relative velocity, instantaneous center of velocity, Velocity polygons for four bar mechanism and single slider mechanism.

**Kinetics of Rigid Bodies:** Equation of motion, translatory motion and fixed axis rotation, application of work energy principles to rigid bodies conservation of energy.

Shear force and bending Moment Diagram.

[T1, T2, R1, R2, R4, R5][No. of Hrs. 08]

**Text Books:**

[T1] Engg Mechanics by A.K.Tayal (Umesh Publications).

[T2] Engg Mechanics by Basudeb Bhattacharya (Oxford university Press)

**Reference Books:**

[R1] Engg Mechanics by Irving H. Shames (Pearson publications).

[R2] Engg Mechanics by U.C.Jindal (Galgotia Publications).

[R3] Engg Mechanics by Beer &amp; Johnston( TMH).

[R4] Engg Mechanics by K.L.Kumar (TMH).

[R5] Engg Mechanics by Sadhu Singh (Khanna Publishers).



**COMMUNICATION SKILLS****Paper Code: ETHS – 112****L T C****Paper: Communication Skills****2 1 3****INSTRUCTIONS TO PAPER SETTERS:****MAXMIUM 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.

*Objective: To enhance the language and communication competence of professional students with emphasis on English for Specific Purposes (ESP) through communication skills related activities.*

**UNIT-I**

**I. Basic Remedial Grammar** (Errors in Parts of Speech, Tenses, Verbs and Modal; Reported Speech; Active and Passive Voice; Conditional clauses; Question Tags and Short Responses)

[T1],[R2],[R3][No. of hrs 06]

**UNIT-II**

**II. Vocabulary and usage** (Synonyms and Antonyms; Suffixes and Prefixes; Homophones and Homonyms; One-word substitution; Prepositions; Phrasal verbs and Idioms, Indianism)

[T1],[R2],[R3][No. of hrs 06]

**UNIT-III****(A)**

- I. Types of writing (Expository, Descriptive, Narrative, Analytical and Argumentative)
- II. Definition, description and explanation of scientific objects, instruments and processes etc.
- III. Interpretation and use of charts, graphs and tables in technical writing.[T1],[R1]

**(B)**

- I. Paragraph writing
- II. Precis writing
- III. Comprehension [T1],[R2],[R3]

[No. of hrs 10]

**UNIT-IV**

- I. Reading different types of texts (speed and purpose)[T1]
- II. Reading five essays [T2]
- III. E.M. FORSTER, *What I Believe* (Pg-123)
- IV. JAMES BRYCE, *Some Hints on Public Speaking* (Pg-135)
- V. L.A. HILL, *Principles of Good Writing* (Pg-150)
- VI. A.P.J. ABDUL KALAM, *Work Brings Solace* (Pg-207)
- VII. SALIM ALI, *Man and Nature in India: The Ecological Balance* (Pg-213)

[No. of hrs 10]

**TEXT BOOKS**

- [T1] Technical Communication: Principles and practice (OUP), (Meenakshi Raman and Sangeeta Sharma)  
OXFORD UNIVERSITY PRESS
- [T2] Communication Skills for Engineers, Murli Krishna, Pearson.
- [T3] Wren and Martin: High School English Grammar and Composition; S. Chand
- [T4] Exploration of Ideas; An Anthology of Prose: Orient Blackswan.

**REFERENCE BOOKS:**

- [R1] Professional Communication: Aruna Koneru, MCGRAW HILLS EDUCATION PVT. LTD
- [R2] Wren and Martin: High School English Grammar and Composition; S. Chand
- [R3] Advanced English Grammar and Composition: Gurudas Mukherjee & Inidbar Mukherjee; (ANE BOOKS PVT. LTD.)

**ENVIRONMENTAL STUDIES**

**Paper Code: ETEN-114**

**Paper : Environmental Studies**

<b>L</b>	<b>T</b>	<b>C</b>
<b>2</b>	<b>1</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. Each unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each

***Objective:** The objective of this course is to make students environment conscious. They will be exposed through the fundamental concepts of environment and ecosystem so that they can appreciate the importance of individual and collective efforts to preserve and protect our environment. This course must raise various questions in student's mind that how our environment is inter dependent on various factors and how human being must care for their natural surroundings.*

**UNIT I: Environmental Studies: Ecosystems, Bio-diversity and its Conservation**

**(i) The Multidisciplinary Nature of Environmental Studies-**

Definition, scope and importance of Environmental Studies. Biotic and a biotic component of environment, need for environmental awareness.

**(ii) Ecosystems**

Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structures and function of the following ecosystem:

- (a) Forest ecosystem
- (b) Grassland ecosystem
- (c) Desert ecosystem
- (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

**(iii) Bio-diversity and its Conservation**

Introduction to biodiversity —definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, national and local levels, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity : Habitat loss, Poaching of wildlife, man-wildlife conflicts, rare endangered and threatened species(RET) endemic species of India, method of biodiversity conservation: *In-situ* and *ex-situ* conservation.

[T1], [R3][No. of hrs. 08]

**UNITII: Natural Resources: problems and prospects**

**(i) Renewable and Non-renewable Natural Resources**

Concept and definition of Natural Resources and need for their management

- *Forest resources:* Use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.
- *Water resources:* Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems, Water conservation, rain water harvesting, watershed management.
- *Mineral resources:* Uses are exploitation, environmental effects of extracting and using mineral resources, case studies.
- *Food resources:* World food problems, changes causes by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- *Energy resources:* Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Urban problems related to energy, case studies.
- *Land resources:* Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

[T1], [R3][No. of hrs. 08]

**UNIT III: Environmental Chemistry and Pollution Control****(i) Chemistry of Environment****(a) Green Technology**

Principles of Green technology, Zero Waste Technology, Green Chemistry & Its basic principles, Atom Economy, Green Methodologies. clean development mechanisms (CDM), concept of environmental impact assessment,

**(b) Eco-Friendly polymers**

Environmental degradation of polymers, Biodegradable, Photo-biodegradable polymers, Hydrolysis & Hydrobiodegradable, Biopolymers & Bioplastics: polylactic acid, polyhydroxybutyrate, polycaprolactone,. Concept of bioremediation.

**(ii) Environmental Pollution**

Definition, types, causes, effects and control measures of (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards. Pollution case studies. Solid waste and its management: causes, effects and control measures of urban and industrial waste.

**Chemical toxicology**-Terms related to toxicity, impact of chemicals (Hg, As, Cd, Cr, Pb) on environment.

[T1], [R3][No. of hrs. 08]

**UNIT IV: Disaster Management, Social Issues, Human Population and the Environment****(i) Disaster Management**

Disaster management: floods, earthquake, cyclone and land-slides, nuclear accidents and holocaust, *case studies*.

**(ii) Social Issues, Human Population and the Environment**

Sustainable development, Climate change, global warming, acid rain, ozone layer depletion, Environmental ethics: Issues and possible solutions, Consumerism and waste products, , Wasteland reclamation. Population growth, problems of urbanisation.

Environment Protection Act, 1986; Air (Prevention and Control of Pollution) Act, 1981; Water (Prevention and Control of Pollution) Act, 1974; Wildlife Protection Act, 1972; Forest Conservation Act, 1980; Environmental management system standards-ISO 14000 series.

[T1][No. of hrs. 08]

**Text Books:**

[T1] E. Barucha, *Textbook of Environmental Studies for Undergraduate Courses*, Universities Press (India) Pvt. Ltd., 2005.

[T2] S. Chawla, *A Textbook of Environmental Studies*, McGraw Hill Education Private Limited, 2012

**References Books:**

[R1] G. T. Miller, *Environmental Science*, Thomas Learning, 2012

[R2] W. Cunningham and M. A. Cunningham, *Principles of Environment Science: Enquiry and Applications*, Tata McGraw Hill Publication, N. Delhi, 2003.

[R3] R. Rajagopalan, *Environmental Studies: From Crisis to Cure*, 2<sup>nd</sup> Edition, Oxford University Press, 2011.

[R4] A.K. De, *Environmental Chemistry*, New Age Int. Publ. 2012,.

[R5] A. Kaushik and C.P. Kaushik, *Perspectives in Environment Studies*, 4<sup>th</sup> Edition, New Age International Publishers, 2013

[R6] *Environmental Engineering* by Gerard Kiely, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2010.

**APPLIED PHYSICS LAB – II****Paper Code: ETPH-152****Paper: Applied Physics Lab – II****P**  
**2****C**  
**1****LIST OF EXPERIMENTS**

1. To determine the e/m ratio of an electron by J.J. Thomson method.
2. To measure the frequency of a sine-wave voltage obtained from signal generator and to obtain lissajous pattern on the CRO screen by feeding two sine wave signals from two signal generators.
3. To determine the frequency of A.C. mains by using Sonometer .
4. To determine the frequency of electrically maintained tuning fork by Melde's method.
5. Computer simulation (simple application of Monte Carlo): Brownian motion, charging & discharging of a capacitor.
6. To study the charging and discharging of a capacitor and to find out the time constant.
7. To study the Hall effect.
8. To verify Stefan's law.
9. To determine the energy band gap of a semiconductor by four probe method/or by measuring the variation of reverse saturation current with temperature.
10. To study the I-V characteristics of Zener diode.
11. To find the thermal conductivity of a poor conductor by Lee's disk method.
12. To study the thermo emf using thermocouple and resistance using Pt. Resistance thermometer.

**Suggested Books:**

[T1] C. L. Arora 'B. Sc. Practical Physics' S. Chand, Latest edition.

**Note:** Any 8-10 experiments out of the list may be chosen. Proper error – analysis must be carried out with all the experiments.

Electronic Devices

Paper Code: ETEC-156  
 Paper: Electronic Devices Lab

P	C
2	1

LIST OF EXPERIMENTS

1. Introduction to C.R.O, Function Generator & Bread Board Kit & to generate different types of waveform with the help of Function Generator & to calculate their frequency, amplitude AC & DC voltage.
2. Identification & testing of Active & passive components
3. To plot V-I characteristics of a semiconductor diode & Calculate Static & Dynamic Resistance
4. To Study the Reverse characteristics of Zener diode
5. To Study the Rectifier circuit.
  - a) Half Wave Rectifier
  - b) Centre Tapped Rectifier.
  - c) Bridge Rectifier.
6. To Study the output waveforms of different Filter Ckts of Rectifier.
7. To Plot Input & Output characteristics CB transistor.
8. To Plot Input & Output characteristics of CE transistor.
9. Realization of basic gates.
10. Implementation of Boolean functions (two or three variables).
11. Few experiments mentioned above to be performed on P-spice.
12. To develop a working model of any electronic circuit.

**Note:- Any 8-10 Experiments out of the list may be chosen.**



**ENGINEERING MECHANICS LAB**

**Paper Code: ETME-158**  
**Paper: Engineering Mechanics Lab**

**P**    **C**  
**2**    **1**

**LIST OF EXPERIMENTS:**

1. To verify the law of Force Polygon
2. To verify the law of Moments using Parallel Force apparatus. (simply supported type)
3. To determine the co-efficient of friction between wood and various surface (like Leather, Wood, Aluminum) on an inclined plane.
4. To find the forces in the members of Jib Crane.
5. To determine the mechanical advantage, Velocity ratio and efficiency of a screw jack.
6. To determine the mechanical advantage, Velocity ratio and Mechanical efficiency of the Wheel and Axle
7. To determine the MA, VR,  $\eta$  of Worm Wheel ( 2-start)
8. Verification of force transmitted by members of given truss.
9. To verify the law of moments using Bell crank lever
10. To find CG and moment of Inertia of an irregular body using Computation method.

**Note:- Any 8-10 Experiments out of the list may be chosen.**



**PROGRAMMING LAB**

<b>Paper Code</b>	<b>:</b>	<b>ETCS 154</b>	<b>P</b>	<b>C</b>
<b>Paper</b>	<b>:</b>	<b>Programming Lab</b>	<b>2</b>	<b>1</b>

**LIST OF EXPERIMENTS**

For program development an IDE e.g. CodeBlock<sup>[a]</sup>, Eclipse CDT<sup>[b]</sup>, Netbeans<sup>[c]</sup> is recommended

1. Write a program to find divisor or factorial of a given number.
2. Write a program to find sum of a geometric series
3. Write a recursive program for tower of Hanoi problem
4. Write a recursive program to print the first m Fibonacci number
5. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices  
Addition of two matrices  
Subtraction of two matrices  
Finding upper and lower triangular matrices  
Transpose of a matrix  
Product of two matrices.
6. Write a program to copy one file to other, use command line arguments.
7. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.
8. Write a program to perform the following operators on Strings without using String functions  
To find the Length of String.  
To concatenate two string.  
To find Reverse of a string.  
To Copy one string to another string.
9. Write a Program to store records of an student in student file. The data must be stored using Binary File. Read the record stored in "Student.txt" file in Binary code. Edit the record stored in Binary File. Append a record in the Student file.
10. Write a program to count the no of Lowercase, Uppercase numbers and special Characters presents in the contents of File.
11. Two Mini Projects based on the skills learned in experiments 1-10 [ These mini projects may be done in a group not exceeding group size of 4 ]

[a] <http://www.codeblocks.org/>

[b] <http://www.eclipse.org/cdt/>

[c] <https://netbeans.org/features/cpp/>

**Note:- Any 8-10 Experiments out of the list may be chosen.**

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**ENVIRONMENTAL STUDIES LAB**

Paper Code –ETEN-160

**P****C**

Paper : Environmental Studies Lab

**2****1****LIST OF EXPERIMENTS**

1. Determination of pH, conductivity and turbidity in drinking water sample.
2. Determination of pH and conductivity of soil/sludge samples.
3. Determination of moisture content of soil sample.
4. Determination of Total Dissolved Solids (TDS) of water sample.
5. Determination of dissolved oxygen (DO) in the water sample.
6. Determination of Biological oxygen demand (BOD) in the water sample.
7. Determination of Chemical oxygen demand (COD) in the water sample.
8. Determination of Residual Chlorine in the water sample.
9. Determination of ammonia in the water sample.
10. Determination of carbon dioxide in the water sample.
11. Determination of nitrate ions or sulphate ions in water using spectrophotometer.
12. Determination of the molecular weight of polystyrene sample using viscometer method.
13. Base catalyzed aldol condensation by Green Methodology.
14. Acetylation of primary amines using eco-friendly method.
15. To determine the concentration of particulate matter in the ambient air using High Volume Sampler.

**P.S.:** For better understanding of various aspects of environment visits to local areas, depending upon easy access and importance may be planned to any nearby river, forest, grassland, hills and students should write a report based on their observations.

**Suggested Books:**

1. [A. I. Vogel, G. H. Jeffery](#), *Vogel's Text Book of Quantitative Chemical Analysis*, Published by Longman Scientific & Technical, 5<sup>th</sup> Edition, 1989.
2. [dst.gov.in/green-chem.pdf](http://dst.gov.in/green-chem.pdf) (monograph of green chemistry laboratory experiments).
3. S. Chawla, *Essentials of Experimental Engineering Chemistry*, Dhanpat Rai & Co., 3<sup>rd</sup> Edition, 2008.
4. S. Rattan, *Experiments in Applied Chemistry*, Published by S.K.Kataria & Sons, 2<sup>nd</sup> Edition, 2003.
5. W. Cunningham and M. A. Cunningham, *Principles of Environment Science: Enquiry and Applications*, Tata McGraw Hill Publication, N. Delhi, 2003.
6. A. Kaushik and C. P. Kaushik, *Perspectives in Environment Studies*, 4<sup>th</sup> Edition, New Age International Publishers, 2013.

**Note:- Any 8-10 Experiments out of the list may be chosen.**

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**NUMERICAL ANALYSIS AND STATISTICAL TECHNIQUES**

<b>Paper Code: ETMA-203</b>	<b>L</b>	<b>T/P</b>	<b>C</b>
<b>Paper: Numerical Analysis and Statistical Techniques</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:** To develop numerical ability and to impart knowledge in Statistical methods and Probability theory and their applications in Engineering to enable them to apply that for solving real world problems.*

**UNIT I**

Probability Theory: conditional probability, Baye's theorem, Random variable: discrete probability distribution, continuous probability distribution, expectation, moments, moment generating function, skewness, kurtosis, binomial distribution, Poisson distribution, normal distribution, Curve Fitting: Principle of least square Method of least square and curve fitting for linear and parabolic curve .

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

**UNIT II**

Correlation Coefficient, Rank correlation, line of regressions and properties of regression coefficients, ANOVA, Sampling distribution: Testing of hypothesis, level of significance, sampling distribution of mean and variance, Chi-square distribution, Student's T- distribution, F- distribution, Fisher's Z- distribution.

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

**UNIT III**

Numerical Methods: Solution of algebraic and transcendental equations using bisection method, Regula-Falsi method and Newton – Raphson method. Solution of linear simultaneous equations using Gauss-Jacobi's iteration method and Gauss-Seidal's iteration methods. Finite differences: Forward differences, backward differences and Central differences. Interpolation: Newton's interpolation for equi-spaced values. Stirling's central difference interpolation formula, Divided differences and interpolation formula in terms of divided differences, Lagrange's interpolation formula for unequi-spaced values.

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

**UNIT IV:**

Numerical Differentiation, maxima and minima of a tabulated function. Numerical Integration: Newton-Cote's quadrature formula, Trapezoidal rule, Simpson's one-third rule and Simpson's three-eighth rule .Numerical solution of ordinary differential equations: Picard's method, Taylor's method, Euler's method, modified Euler's method, Runge-Kutta method of fourth order.

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

**Text Books:**

- [T1] R.K. Jain and S.R.K. Iyengar, "Numerical methods for Scientific and Engineering Computation", New Age.
- [T2] N.M. Kapoor, "Fundamentals of Mathematical Statistics", Pitambar Publications

**Reference Books:**

- [R1] E. kresyzig, "Advance Engineering Mathematics", Wiley publications
- [R2] P. B. Patil and U. P. Verma, " Numerical Computational Methods", Narosa
- [R3] Partial Differential Equations "Schaum's Outline Series", McGraw Hill.
- [R4] Michael Greenberg, "Advance Engineering mathematics", Pearson.
- [R5] Schaum's Outline on Fourier Analysis with Applications to Boundary Value Problem, TMH
- [R6] B.S. Grewal., "Numerical Methods in Engg. And Science", Khanna Publications.
- [R7] Miller and Freund, "Probability and statistics for Engineers", PHI
- [R8] Gupta and Kapoor, "Fundamentals of Mathematical Statistics" Sultan Chand and Sons.

**STRENGTH OF MATERIAL**

**Paper Code: ETCE-203**  
**Paper: Strength of Material**

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: To develop knowledge of mechanics and to have in-depth understanding of material responses to load.*

**UNIT I**

**Simple stresses and strains :** Definition, types of stresses and strains; Hooke's law, Modulus of elasticity, various elastic constants and their relationship, stress strain curve for ductile materials, deformation of bars under axial loads, temperature stresses, bars of varying cross sections and composite sections, Poisson's ratio, volumetric strain, Strain rosette.

**Analysis of plane stress and plane strain:** General case of plane stress, Principle stresses due to combined bending and torsion, Analysis of strain, Mohr's circle for 2 dimensional stresses and strain, and Elementary concepts of theories of failure.

**[T1,T2][No. of Hrs. 12]****UNIT II**

**Shear force and bending moment:** Different types of beams and loads, shear force and bending moment diagrams for cantilever and simply supported beams with and without overhangs subjected to different kinds of loads, relation between loading, shear force and bending moments.

**Bending and shear stresses in beams:** Theory of simple bending, moment of resistance, modulus of section, calculation of bending stresses in beams for different loads and different types of structural sections. Shear stress and its distribution on different types of cross sections of beams.

**[T1,T2][No. of Hrs. 11]****UNIT III**

**Combined direct and bending stresses:** Middle third rule, core of a section, stresses due to wind, water and earth pressure in structures like retaining walls, dams, chimneys, walls etc.

**Slope and deflection of beams:** Relation between slope, deflection and radius of curvature, deflection and slope of statically determinate beams; moment area method, double integration method, conjugate beam method, dummy load method, Maxwell's law of reciprocal deflection, Betti's law and Castigliano's theorem and their applications.

**[T1,T2][No. of Hrs. 11]****UNIT IV**

**Torsion:** Torsion of hollow and solid circular shafts, torsion equation, torsional rigidity, modulus of rupture, power transmission by shafts, importance of angle of twist and various stresses in a shaft, comparison of solid and hollow shafts, torsional resilience.

**Columns and struts:** Columns and struts of uniform section, crippling/buckling load, Euler theory and concept of equivalent length, Rankine's formula and other empirical formulae, Secant formula.

**[T1,T2][No. of Hrs. 10]****Text Books:**

- [T1] James M Gere, "Strength of Materials", Cengage Publication  
 [T2] Timoshenko, Stephen, Elements of Strength of Materials Part-2, CBS publication

**References:**

- [R1] Mechanics of Materials, Popov E.P., Prentice Hall of India  
 [R2] Solid Mechanics, S.M.A Kazmi  
 [R3] Structures, Schodek, Pearson Education  
 [R4] Strength of Materials, Nash, W.A., Tata Mc Graw Hill Publications  
 [R5] Basic Structural Analysis, Reddy, Mc Graw Hill Publications  
 [R6] B.S. Basavarajiah, P. Mahadevappa, "Strength of Materials", 3<sup>rd</sup> Edition, University Press.

**FLUID MECHANICS**

**Paper code: ETCE-205**  
**Paper: Fluid Mechanics**

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: To develop knowledge of properties, movement and behavior of fluid (water) under various flowing conditions. At the end of the course, students will have in-depth knowledge of fluid mechanics, measurement of fluid flow.*

**UNIT I**

**Introduction:** Fluid properties, Ideal and real fluids, Concept of viscosity, surface tension and compressibility; thermodynamic (isothermal, isobaric and adiabatic) properties.

**Fluid Statics:** Fluid pressure and its measurement, types of manometers, Total pressure and centre of pressure, Evaluation of pressure force on dams, lock gates, curved surfaces, pressure distribution in liquid subjected to constant horizontal/vertical acceleration, principles of equilibrium, buoyancy, centre of buoyancy, meta centre, stability conditions of floating and submerged bodies, Experimental and analytical method of determination of meta-centric height.

**[T1,T2][No. of Hrs. 12]****UNIT II**

**Fluid Kinematics:** Variation of flow parameters in space and time, Lagrangian and Eulerian concepts in fluid motion, Types of fluid flow: steady and unsteady, uniform and non uniform, rotational and irrotational, Laminar and turbulent, one, two and three dimensional flow, streamline, pathline and streakline, Continuity equation in Cartesian and polar co-ordinates and its applications, Velocity potential and stream function, Cauchy-Riemann equation, flownet.

**Types of motion:** Linear translation, linear deformation, Angular deformation, Rotation, Vorticity, Free and forced vortex flow.

**[T1,T2][No. of Hrs. 12]****UNIT III**

**Fluid Dynamics :** Reynolds's, Navier-Stokes and Euler's equations of motion, Derivation of Bernoulli's equation from Euler's equation and its limitations, Applications of Bernoulli's equations-Orifice, Venturimeter, Mouth piece, Weir and notch, Pitot's tube, Siphon, etc; hydraulic gradient and total energy lines and their Engineering significance. Momentum equation, Moment of momentum equation- Assumptions and limitations, applications, impact of jets and forces in bends.

**[T1,T2][No. of Hrs. 11]****UNIT IV**

**Dimensional and Model Analysis:** Dimensional homogeneity, methods of dimensional analysis, Buckingham's  $\pi$  theorem, selection of Repeating variables, Forces acting on moving fluid, Dimensionless numbers and their Engineering significance, Model analysis, Geometric, Kinematic and Dynamic similarity, Model testing of partially submerged bodies, scale ratios for distorted models.

**[T1,T2][No. of Hrs. 10]****Text Books:**

- [T1] R.J. Garde, "Fluid Mechanics through Problems", New Age Publications  
 [T2] A.K. Jain, "Fluid Mechanics and Fluid Machines", Khanna Publishers, New Delhi

**References:**

- [R1] Victor Streeter, "Fluid Mechanics", International Edition, Tata McGraw Hill Publications  
 [R2] Hughes and Brighton, "Fluid Mechanics", Tata McGraw Hill  
 [R3] Shames, "Mechanics of Fluids", Tata McGraw Hill  
 [R4] Neville, "Fluid Mechanics", Pearson Education  
 [R5] A. James, Fay, "Introduction to Fluid Mechanics", PHI Publications

**BUILDING MATERIALS AND CONSTRUCTION**

**Paper Code: ETCE-207**

**Paper: Building Materials and Construction**

<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: In this course, students will learn about different types of materials that are used in the construction industry to create buildings and structures.*

**UNIT I**

**Building Materials:** Properties and uses of common types of stones, bricks, tiles and hollow building blocks, Pozzolonic Material, Cement, lime and mortar, Properties, types and applications of other building materials like timber, protective coverings [Paints and varnishes], rubber, bitumen, tar and asphalt, glass, plastics and polymers, refractory materials etc.

Plastering, Pointing, Painting, distempering, white washing, damp proofing, ventilation and air conditioning, Concept of thermal insulation, sound insulation, fire protection.

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

**UNIT II**

**Concrete:** Cement, Sand, aggregates and water, Batching of concrete by weight and volume, Batching plant and equipment, workability, mix proportions and grades of concrete, types of mixers, transportation, pumping, placing and compacting of concrete. Admixtures, Formwork for RCC structures, Ready mix concrete, Pre-cast concrete.

**Types of concrete:** Special concrete, light weight concrete, high density concrete, vacuum concrete, shotcrete – steel fiber reinforced concrete, polymer concrete, Ferro cement, high performance concrete, self compacting concrete.

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

**UNIT III**

**Building construction:** Components of building, shallow and deep foundations, Stone and brick masonry, type of bonds, load bearing walls, cavity wall, partition walls, finishing/coating materials for Roofs/floors/walls, construction and expansion joints, Introduction to Green building and LEED Classifications.

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

**UNIT IV**

**Stairs, lintels, trusses, arches, domes, doors and windows:** Introduction, classification, types, material of construction.

**Special Materials and Systems:** Smart materials and structures, geosynthetics, nano-materials and bio-materials, Fire resistant materials, Sound Insulation.

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

**Text Books:**

[T1] M.L.Gambhir and Neha Jamwal, “Building Materials”, Tata McGraw Hill.

[T2] Shushil kumar, “Building Construction”, Standard Publication

**References Books:**

[R1] Building Materials, P.C.Varghese, PHI Publications

[R2] Building construction, P.C.Varghese, PHI Publications

[R3] Engineering materials S.C. Rangwala, Charotar Publishing House

[R4] Building Materials, Duggal, New Age Publication

[R5] Building and Construction Materials, M.L. Gambhir and Neha Jamwal, Mc-Graw Hill

SURVEYING

Paper Code: ETCE-209

Paper: Surveying

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: The successful completion of the course will enable the students to understand angle and distance measurement; differential, profile, cross-section, and topographic leveling procedures using conventional equipments and use of GPS and DGPS and apply them to field conditions.*

**UNIT I**

**Linear Measurement:** Introduction, Principles of chain survey, use and adjustment of various instruments employed in chain survey, chaining on sloping grounds, Offsets and error in offsets, Obstructions in chaining, chaining angles, Errors and sources of error, Introduction to advance linear measuring instruments, Field book.

**Compass Survey:** Use and adjustment of prismatic and surveyor's compass, Methods of surveying with a compass, Magnetic declination, local attraction, Errors in prismatic survey, plotting of compass survey, distribution of closing error.

**Leveling:** Definition and working principles of a leveling instrument and its various parts with reference to the bubble tube and the telescope, Use and adjustment of dumpy and tilting levels, Establishment of Bench Marks by leveling, Longitudinal leveling, Cross section leveling, fly leveling and reciprocal leveling, Methods of booking and reduction of levels. Errors in leveling, Curvature and refraction correction, Advanced leveling instruments.

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

**UNIT II**

**Theodolite Survey:** Study of theodolite, Temporary and permanent adjustments, Measurement of horizontal angles, methods of repetition and reiteration, Measurement of vertical angles, advanced electronic and laser theodolites.

**Contouring:** Definition of contours, contour interval, characteristics of contours, Direct and indirect methods of contouring, uses of contours, Estimation of volumes of the earthwork by means of contour lines and section, Grade contours, Topographic maps.

[T1,T2][No. of Hours: 10]

**UNIT III**

**Tacheometric Surveying:** Stadia system, Fixed and movable hair methods, staff held vertical and normal, Instrument constants, Analytic lens, Tangential system, direct reading tachometer, subtense bar.

**Plane Table Survey:** Instruments employed in plane table survey, Use and adjustment of these instruments including simple alidade. Working operations like fixing, leveling, centering and orientation, Methods of orientation, various methods of plane table survey. Three point and two point problems. Errors in plane table survey, Contouring using clinometer, Advantages and disadvantages of plane tabling.

[T1,T2][No. of Hours: 10]

**UNIT IV**

**Triangulation:** Principal, selection of base line and stations, order of triangulation, triangulation figures, scaffold and signals, marking of stations, Intervisibility and heights of stations, satellite stations, base line measurement and corrections, Introduction to adjustment of observations.

**Curves:** Types of curves, Elements of a curve, Simple curves, different methods of setting out, Introduction to compound, reverse, transition and vertical curves. Introduction to modern surveying Instruments /Techniques like Total station, GPS etc

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

**Text Books:**

[T1] Plane Surveying, A.M. Chandra., New Age International Publications

[T2] Punmia B.C., Jain A.K. and Jain A.K., "Surveying", Volume I and II, Laxmi Publications (P) Ltd., New Delhi.

**References:**

- [R1] K.R. Arora, Surveying Vol. I and II Standard Book House, New Delhi
- [R2] Surveying, Arthur Bannister, Pearson Education
- [R3] Surveying, Mimi Das Saikia, Madan Mohan Das, PHI Publications
- [R4] Fundamentals of Surveying, S.K. Roy, PHI Publications
- [R5] Surveying and Leveling, T. P. Kanetkar and Kulkarni, Standard Publishers
- [R6] C. Venkatramaiah, "Textbook of Surveying", 2<sup>nd</sup> Edition, University Press.



**ENGINEERING GEOLOGY**

**Paper Code: ETCE-211**

**L T/P C**

**Paper: Engineering Geology**

**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.

*Objectives: To expose various geological formations and processes involved such as weathering, erosion etc. Further the concepts of structural geology and photogeology have been discussed for their relevance in the field of Civil Engg. This subject also includes causes, effects and measurement of earthquakes and seismic zoning map of India. The course aims at identifying appropriate sites for civil engineering projects such as Dams, Bridges, Tunnels etc., based on geological factors.*

**UNIT I**

**Introduction:** Definition and scope of geology, its importance to Civil Engineers, Interior of earth, earth movement.

**Rocks and minerals:** Physical properties of minerals and their occurrence and uses, Classification and occurrence of rocks, Building and ornamental stones.

**Geological processes:** Weathering of rocks, agents of weathering, products of weathering, soil formation, soil profile, Erosion by running water, winds and glaciers.

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

**UNIT II**

**Structural Geology:** Stratification, Altitude of formation, dip, strike, apparent dip, Faults, folds, joints and their engineering importance.

[T1,T2][No. of Hours: 10]

**UNIT III**

**Hydrogeology:** Definition, source of ground water, ground water storage and circulation. Quality of ground water, hot water springs.

**Introduction of Engineering Seismology:** Earthquakes and its causes and effects, waves generated, basic terminology, Earthquakes and its measurements, Distribution of earthquakes in the World and in India, Seismic Zoning map of India.

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

**UNIT IV**

**Photogeology:** Aerial photographs, their importance in the field of civil engineering, stereoscope and its use.

**Dams and Reservoirs:** Geological investigations for dams and reservoirs. Examples of dam failures due to geological causes, Geological study for selecting site for dam and reservoir.

**Bridges, highways and buildings:** Geological investigations.

**Tunnels through rocks:** Definition. Purposes for tunneling, Geological background for selecting a site for a tunnel.

**Landslides:** Definition, causes and effects. Types of landslides, Preventive measures.

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

**Text Books:**

[T1] D. Vankat Reddy, "Engineering Geology", Vikas Publications

[T2] P.C.Varghese, "Engineering Geology for Civil Engineers", PHI Publications

**References Books:**

[R1] Bangar, "Principles of Engineering Geology", Standard Publishers and distributors

[R2] Kesavulu, "Textbook of Engineering Geology", Macmillan India Ltd

[R3] Dona, Mineralogy, Willey Eastern Limited, 1992

[R4] Hries and Watson, "Engineering Geology",

[R5] Tirifethen Van, "Geology of Engineering", Nebard

[R6] Kanithi, "Engineering Geology", University Press

**NUMERICAL ANALYSIS AND STATISTICAL TECHNIQUES LAB**

<b>Paper Code: ETMA-253</b>	<b>L</b>	<b>T/P</b>	<b>C</b>
<b>Paper: Numerical Analysis and Statistical Techniques Lab</b>	<b>0</b>	<b>2</b>	<b>1</b>

**List of experiments:-**

1. Solution of algebraic and transcendental equation.
2. Algebra of matrices: Addition, multiplication, transpose etc.
3. Inverse of a system of linear equations using Gauss-Jordan method.
4. Numerical Integration.
5. Solution of ordinary differential equations using Runge-Kutta Method.
6. Solution of Initial value problem.
7. Calculation of eigen values and eigen vectors of a matrix.
8. Plotting of Unit step function and square wave function.

It is expected that atleast 12 experiments be performed, including the above specified 8 experiments which are compulsory. The remaining experiments may be developed by faculty and students based on applications of Mathematics in Real Life problem.

**Text Books:**

- [T1] B.S. Grewal., “Numerical Methods in Engg. And Science”, Khanna Publications  
 [T2] P. Dechaumphai and N. Wansophark, “Numerical Methods in Engg.: Theories with Matlab, Fortran, C and Pascal Programs”, Narosa Publications

**Reference Books:**

- [R1] P.B. Patil and U.P. Verma, “Numerical Computational Methods”, Narosa Publications  
 [R2] John C. Polking and David Arnold, “Ordinary Differential Equations using MATLAB”, Pearson Publications  
 [R3] Rudra Pratap, “Getting Started With MatLab” Oxford University Press  
 [R4] Byrom Gottfried, “Programming With C” Shaum’s Outline  
 [R5] Santosh Kumar, “Computer based Numerical and Statistical Techniques”, S. Chand Publications.

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**FLUID MECHANICS LAB****Paper code: ETCE-253****Paper: Fluid Mechanics Lab**

L	T/P	C
0	2	1

**Course Outline:**

Based on theory 8-10 experiments are to be performed. The list is provided below:

**LIST OF EXPERIEMNTS:**

1. Determination of metacentric height
2. Calibration of a venturimeter
3. Determination of frictional losses in pipes of different diameters.
4. Determination of minor losses in pipes
5. Calibration of a, V- notch and rectangular notch
6. Reynolds dye experiment for flow characterization
7. Determination of  $c_c$ ,  $c_v$  and  $c_d$  of an orifice
8. Verification of Bernoulli's theorem
9. Calibration of orifice meter
10. Verify the impulse momentum equation [impact of jet]

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**

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**CIVIL ENGINEERING DRAWING USING CAD LAB**

**Paper Code: ETCE-255**

**L T/P C**

**Paper: Civil Engineering Drawing using CAD Lab**

**0 2 1**

**Course Outline:**

Drawing work using CAD: Plan, elevation, section and views of residential buildings, different types of roofs, sanitary and water supply works, road works, culverts, bridges, wells, and irrigation works, etc.



**SURVEYING LAB****Paper Code: ETCE-257****Paper: Surveying Lab**

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

**Based on theory courses ETCE 209 (10- 12 experiments)**

1. Linear measurement using tape, chain and tacheometric methods.
2. Levelling using Autolevel
3. Plotting of the area using radiation, intersection and linear measurement.
4. Solution to three point problem using Plane table.
5. Measurement of horizontal and vertical angles by Vernier Theodolite.
6. Measurement of horizontal and vertical angles using Electronic Theodolite.
7. Preparation of close traverse of about 1km periphery using Total Station.
8. Adjustment of close traverse.
9. Adjustment of angles of a given triangulation network.
10. Use of DGPS for drawing a map of roads covering an area of about 5 sq. kms.
11. Traverse computation using appropriate softwares like Autoplotter.
12. Computation of missing side/ angle of a polygon (triangle/ quadrilateral) and error estimation.
13. Laying out of simple curve.

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**


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**GEOLOGY AND BUILDING MATERIAL LAB****Paper Code: ETCE-259****L T/P C****Paper: Geology and Building Material Lab****0 2 1**

Based on theory 8-10 experiments are to be performed. The list is provided below:

**ENGINEERING GEOLOGY**

1. Study of Geological map and section of local area
2. Study the various properties of igneous rocks, sedimentary and metamorphic through rocks samples.
3. Study the various properties of different minerals and mineral ores through samples.
4. Study the various types of folds and faults.
5. Physical properties of minerals such as, hardness, colour, streak, etc.
6. Numerical Problems related to Dip and Strike
7. Study of different geological features through models
8. Field visit

**BUILDING MATERIALS**

1. Assessment of physical properties of bricks, such as, absorption, shape and size, structure, soundness, hardness, presence of soluble salts.
2. Hardness, impact and water absorption test etc for stones
3. Study on different types of bonds for bricks and stones
4. Study on defects in timber

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**

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**WATER ENGINEERING**

**Paper Code: ETCE-202**  
**Paper: Water Engineering**

<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: To familiarize the students with the basics of water quality and its treatment methods, importance of planning, analysis and design of modern water supply schemes.*

**UNIT I**

**Demand of water:** Domestic, commercial and public requirements, Factors affecting demand fluctuations, Estimate of prospective population, fire demand requirements and other allowances.

**Sources of water:** Estimating the quantity of water from various sources, surface and underground sources, such as, impounded, perennial stream, shallow wells artesian wells, deep wells, infiltration galleries, intake works from different sources.

**Water quality:** Suspended solids, turbidity, colour, taste odour, temperature, Total dissolved solids, pH, acidity, alkalinity, hardness, nitrates, chlorides, fluorides, metals, organics, nutrients, and Pathogens.

**In-stream standards:** Potable water standards, waste water / effluent standards, standards for receiving wastes in natural streams / sewer / sea, Bio-monitoring of streams and lakes Groundwater quality, chemical/ biological remediation of ground water.

**[T1][No. of Hours: 12]****UNIT II**

**Water purification processes in natural system:** Water pollutants and their sources, Physical processes: Dilution, sedimentation and re-suspension, filtration, gas transfer, heat transfer, Chemical processes, metabolic processes, role of micro-organisms in natural water systems. Stream water quality changes due to waste disposal, Streeter-Phelps D.O. model, and water quality management of rivers having multiple discharges, lakes and estuaries.

**[T2][No. of Hours: 11]****UNIT III**

**Analysis and Design [as per CPHEEO manual etc] of Engineered systems for water purification:** Water treatment process and design, economic construction in water works design, solids separation by aeration, settling operations, coagulation, softening, mixing and flocculation, sedimentation.

**Analysis and design of other system for water purification:** Filtration, disinfection, [Residual chlorine, chlorine demand and brake point chlorination] adsorption, membranes, Water plant waste management, Pump drive units and analysis of pumping systems.

**[T2,T3][No. of Hours: 12]****UNIT IV**

**Distribution system:** Methods of distributing water, distribution reservoirs, stand pipes and water tanks, design of pumping mains, use of nomograms, appurtenances, distribution systems and their components, capacity and pressure requirements, design of distribution systems, hydraulic analysis of distribution systems.

**[T1][No. of Hours: 10]****Text Books:**

- [T1] S.K. Garg, "Water Supply Engineering", Khanna Publishers.  
 [T2] Davis and Cornwell, "Introduction to Environmental Engineering", McGraw Hill  
 [T3] Peavy, Rowe and Tchobanoglous, "Environmental Engineering", McGraw Hill

**References:**

- [R1] Henry and Heinke, "Environmental Science and Engineering", Prentice Hall India  
 [R2] Venugopala Rao, "Principles of Environmental Science and Engineering", Prentice Hall India  
 [R3] Gilbert M. Masters, "Introduction to Environmental Engineering" Prentice Hall India.  
 [R4] Kiely, Gerardd "Environmental Engineering" Tata McGraw Hill  
 [R5] Hammer, Hammer "Water and Wastewater Technology" PHI Learning Pvt. Ltd  
 [R6] Qasim, Motley, Zhu "Water works engineering" PHI Learning Pvt. Ltd.  
 [R7] C.D.Gupta, V.K.Gupta "Water Supply Handbook" Jain Brothers

**STRUCTURAL ANALYSIS**

**Paper Code: ETCE-204**  
**Paper: Structural Analysis**

<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:** (i) To identify determinate, indeterminate, stable and unstable structures (ii) To analyze indeterminate trusses, beams and frames using method of consistent deformation, slope deflection method, moment distribution and Kani's method (v) to construct influence lines and be able to use them.

**UNIT I**

**Columns and Struts:** Columns and struts of uniform section, crippling/buckling load, Euler theory and concept of equivalent length, Rankine's formula and other empirical formulae, Secant formula. Combined direct and bending stresses: Middle third rule, core of a section, stresses due to wind, water and earth pressure in structures like retaining walls, dams, chimneys, walls etc.

**Thin cylinders:** Thin cylinders subjected to internal fluid pressure, wire wound thin cylinders. Thin cylindrical shells, circumferential and hoop stresses, longitudinal stresses, Maximum shear stress.

**[T1][No. of Hours: 11]****UNIT II**

**Moving loads and Influence lines :** Introduction to moving loads, concept of equivalent UDL, absolute maximum bending moment and shear force, concept of influence lines, influence lines for reaction, shear force, bending and deflection of determinate beams, Influence line diagram [ILD] for forces in determinate frames and trusses, analysis for different types of moving loads, single concentrated load, several concentrated loads, uniformly distributed load shorter and longer than span, Application of Muller Breslau Principle for determinate structures.

**[T2,T3][No. of Hours: 12]****UNIT III**

**Indeterminate Structures:** Indeterminacy, choice of unknowns, Castigliano's second theorem and its applications. **Method of consistent deformation:** Analysis of indeterminate beams and frames upto two degree of indeterminacy, settlement effects, analysis of pin jointed trusses, externally and internally redundant trusses, effects of settlement and prestrains.

**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][No. of Hours: 11]****UNIT IV**

**Moment distribution and Kani's method:** Analysis of beams and frames.

**Approximate methods of analysis of multistory frames:** Analysis of vertical load, substitute frames, loading condition for maximum positive and negative bending moment in beams and maximum bending moment in columns, analysis for lateral load, portal method, cantilever method and factor method.

**[T3][No. of Hours: 11]****Text Books:**

- [T1] G.S. Pandit, "Structural Analysis", CBS Publication.  
 [T2] Bhavikatti, "Structural Analysis (Vol.I and II)", Vikas Publication  
 [T3] C.K.Wang, "Statically Indeterminate Structures", Mc Graw 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] Vaidyanathan and P Perumal, "Comprehensive Structural Analysis", Laxmi Publications  
 [R5] Sujit kumar Roy, "Fundamental of Structural Analysis", S. Chand Publication.  
 [R6] D.S. Prakash Rao, "Structural Analysis", University Press.

## HYDRAULICS AND HYDRAULIC MACHINES

**Paper Code: ETCE-206**

**Paper: Hydraulics and Hydraulic Machines**

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:** To get knowledge about characteristics of different flow types, flow through pipes, forces on submerged bodies and the working of hydraulic machinery. At the end of course the student will have the knowledge regarding various theories dealing with the flow phenomenon of fluid in pipes and understanding of basics of the hydro-machinery and the components function and use of different types of turbines and pumps.*

### UNIT I

**Laminar Flow :** Flow through circular pipe and parallel plates, Kinetic energy correction factor, Momentum correction factor; Loss of head due to friction; determination of coefficient of viscosity.

**Boundary Layer:** Concept and development of boundary layer, Laminar and turbulent boundary layers and their analysis, boundary layer thickness; Critical Reynolds number; Boundary layer separation and control.

**Turbulent flow:** Shear stress, velocity distribution in smooth and rough pipes, Resistance of smooth and rough pipes.

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

### UNIT II

**Forces on submerged bodies :** Forces exerted by flowing fluid, Concept and expression for Drag and lift; Pressure drag and friction drag; Stream line and bluff body; Drag on sphere and cylinder, Terminal velocity of a body, Lift on a circular cylinder, Drag force acting on a rotating cylinder, Development of lift on Airfoil

**Flow through pipes:** Loss of head / energy in pipes - Major losses-friction loss by Darcy Weisbach formula, Chezy's formula; Types of minor losses; Hydraulic gradient and total energy line, Flow through siphon, Pipes in series, concept of equivalent pipe, flow through parallel and branched pipes; Water hammer in pipes, sudden and gradual closure of valve; Analysis of Pipe network using Hardy Cross method; Use of EPANET software for pipe flow analysis.

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

### UNIT III

**Hydraulic machines:** General layout of hydroelectric power plant, classification of hydraulic turbines, Pelton turbine and its main parts, Analysis and design of Pelton turbine for jet diameter, wheel diameter, width, depth and number of buckets; Hydraulic, mechanical and overall efficiencies of turbine, Introduction to other turbines like Francis and Kaplan turbines, Specific speed and its significance, characteristic curves of turbines.

[T2,T3][No. of Hours: 11]

### UNIT IV

**Centrifugal pumps:** Main parts; Head, efficiencies and work done computations, minimum speed for starting a centrifugal pump, specific speed, centrifugal pump; Cavitations in turbines and centrifugal pumps and their effects and precautions, Computation for maximum suction lift.

**Reciprocating pumps:** Main parts of Reciprocating pump, discharge, work done and power required to drive a double acting pump, Velocity and acceleration in suction and delivery pipes, Indicator diagram and its utility, Air vessels.

[T1,T2][No. of Hours: 10]

#### Text Books:

[T1] Victor Streeter, "Fluid Mechanics", International Edition, Tata McGraw Hill Publications

[T2] R.K.Bansal, "Fluid Mechanics",

[T3] Hughes and Brighton, "Fluid Mechanics", , Tata McGraw Hill

#### Reference Books:

[R1] Vijay Gupta, Santosh K Gupta, "Fluid Mechanics and its Application", New Age Publications.

[R2] R.J.Garde, "Fluid Mechanics through Problems", New Age Publications.

[R3] Douglas, Gasiorek, Swaffield and Jack, "Fluid Mechanics", Pearson Education.

[R4] Fay A. James, "Introduction to Fluid Mechanics", PHI Publications

[R5] Kothandaraman and Rudramoorthy, "Fluid Mechanics and Machinery", New Age Publication

ADVANCED SURVEYING

Paper Code: ETCE-208

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: In this course students will learn the advanced topics of surveying such as, trigonometric leveling, field astronomy, and photogrammetric survey.*

**UNIT I**

**Trigonometric leveling:** Observations for heights and distances Heights and distances, accessible and inaccessible base of the object, Geodetical observations. Terrestrial refraction, correction for refraction and curvature, eye and object correction, determination of difference of elevation by single and reciprocal observations.

**Survey Adjustments and Theory of Errors :** Types of errors, law of errors, law of weights, distribution of error and field measurements, Probability curves, method of least squares, determination of most probable value by normal adjustment and method of correlates, most probable error. Triangulation adjustments: Adjustment of geodetic quadrilateral with and without central station.

**[T1,T2,T3][No. of Hours: 10]****UNIT II**

**Setting out works:** Setting out of buildings, culverts, roads, pipelines, sewers, underground tunnels and centre line of dams, bridge survey, mine survey.

**Route surveying:** Reconnaissance, preliminary and location surveys for road, railway, canal and pipe alignments longitudinal and cross sections, computation of earthwork and mass haul curve.

Introduction to Hydrographic surveying: Shore line survey, soundings, tide and its characteristics, tide gauges, mean sea level as datum.

**[T1,T2,T3][No. of Hours: 10]****UNIT III**

**Photogrammetric Survey:** Basic principles, elevation of a point, determination of focal length of lens, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, scale of a tilted photograph, tilt distortion, relief displacement of a tilted photograph, combined effects of tilt and relief, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, location of principal points, transfer image from photograph to map, stereoscope parallax, parallax in aerial stereoscopic views, parallax equations.

**[T1,T2,T3][No. of Hours: 12]****UNIT IV**

**Field Astronomy:** Co-ordinate systems, latitude and longitude, spherical trigonometry, relation between degrees and hours of time, conversion of local time to standard time, conversion of mean time interval to sidereal time interval, to find local sidereal time (LST) at local mean midnight for given Greenwich sidereal time (GST) at greenwich Mean midnight (GMN), determination of LST from LMT at any instant, determination of LMT of transit of a known star across the meridian for given GST of GMN, Local sidereal time of elongation of star, interpolation of values, instrumental and astronomical correction to observed altitude to the azimuth, observation for time by meridian transit of star and by meridian transit of Sun. Azimuth by observation on Polaris and ex-meridian observation on stars, determination of latitude, calculation of true altitude, declination, latitude, polar distance, determination of longitude.

**[T1][No. of Hours: 12]****Text Books:**

- [T1] Surveying ,B.C. Purnimia-II/III, Laxmi Publication  
 [T2] Higher Surveying,A.M. Chandra,New age Publication  
 [T3] Surveying Vol.2, Duggal, McGraw Hill Education (I) Pvt.Ltd.



**Reference Books:**

- [R1] Higher surveying. Norman Thomas,
- [R2] Surveying Vol. II, Dr. K.R. Arora, Standard Book House, New Delhi
- [R3] Advanced Surveying: Total Station, GIS and Remote Sensing, Gopi, Pearson Education
- [R4] Surveying, Saikai et al, PHI Publications
- [R5] Surveying, Bannister, Raymond and Baker, Pearson Education



**SOIL MECHANICS****Paper Code: ETCE-210****Paper: Soil Mechanics**

<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:** To explain the methods of classifying the soils, to analyze the flow of water through soils, to estimate the stress distribution in the soil mass and compaction characteristics, compressibility characteristics, settlements and to assess the shear strength of the soils.

**UNIT I**

**Soil formation, properties:** Origin of soils, soil formation, geographical distribution of major soils in India, composition of soil, particle size and shapes, interparticle forces, soil minerals / structure and their effect on basic soil properties. Three phase diagram and relationships among void ratio, specific gravity, dry density, porosity, water content, unit weights and degree of saturation.

**Laboratory and field identification of soil:** Determination of water content, specific gravity and grain size distribution for coarse grained and fine grained soils, Atterberg limits and indices, visual identification by simple field test, field density by core cutter and sand, replacement methods.

**Classification of soils:** Necessity, principles, Indian and unified classification, plasticity charts.

**[T1,T2][No. of Hours: 11]****UNIT II**

**Permeability and seepage:** Concept of pore water pressure, Total, effective and neutral stresses. Darcy's law, laboratory and field permeability tests, factors affecting permeability, surface tension and capillary phenomenon in soil, shrinkage and swelling of soil, seepage forces, Laplace equation and its significance, Flow potential, Flow nets and their properties, seepage through earth dams, exit gradient and uplift pressure, mechanics of piping, methods of dewatering, design of filters.

**Stress distribution in soil:** Stress at a point, Mohr's circle, stresses due to force of gravity, Point, line and uniformly distributed loads, Influence charts, contact pressure distribution, Boussinesque's and Westerguard's equation for vertical pressure due to point loads and uniformly distributed loads.

**[T1,T2,T3][No. of Hours: 11]****UNIT III**

**Compaction of soils:** Definition, consolidation and compaction, objectives, compactive effort, Laboratory compaction, Standard Proctor test, Modified Proctor test, IS compaction tests [light / heavy], Field compaction and equipment, Concept of optimum moisture content and zero air voids line, Factors influencing compaction, Effect of compaction on soil properties, Compaction specifications and field control.

**Consolidation and settlement:** Consolidation test and compressibility characteristics, Terzaghi's theory of one dimensional consolidation, types of clay deposits, Normal/over/consolidated clays, determination of pre-consolidation pressure and its significance, time factor and coefficient of consolidation, fitting methods, settlement analysis, secondary compression, consolidation settlement and its rates, acceleration of consolidation by sand drains.

**[T1,T2][No. of Hours: 12]****UNIT IV**

**Shear strength of soil:** Stress strain curve, Mohr-coulomb failure criteria, Peak and residual shear strengths, Laboratory and field measurement of shear strength of soil, Direct, Triaxial and Unconfined compression tests, vane shear tests. Determination of shear strength parameters for different drainage and stress conditions, measurement of pore pressure, choice of test conditions, Shear strength of soils, Pore pressure coefficients, Sensitivity of cohesive soils, use of various types of shear parameters in design.

**[T1,T2][No. of Hours: 11]****Text Books:**

- [T1] Basic And Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, New age international Ltd  
 [T2] Soil Engineering, Alam singh, CBS Publication  
 [T3] Geotechnical Engg, Gulati and Dutta, McGrawHill Education (I) Pvt. Ltd

**Reference Books:**

- [R1] Soil Mechanics and Foundation Engg., Purushothama Raj, Pearson Education  
 [R2] Geotechnical Engg, Venkataramaiah, New Age International Publishers  
 [R3] GeoTechnical Engineering [Principles and Practices], P. Donald, Coduto, PHI Publications  
 [R4] Soil mechanics in engineering practice by Karl Terzaghi, Ralph Brazelton Peck, Gholamreza Mesri, Wiley.  
 [R5] Geotechnical engineering: principles and practices of soil mechanics and foundation engineering, by V. N. S. Murthy, Marcel Dekker  
 [R6] Soil mechanics by Lambe and Whitman Wiley edition



**DESIGN OF CONCRETE STRUCTURE**

**Paper Code: ETCE-212**

**Paper: Design of Concrete Structure**

<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: To provide basic understanding of concrete making materials and their properties, mix design concepts and to make them understood various properties of the hardened concrete. The course also aims at designing of basic elements of structures such as beam, column, slab and foundation.*

**UNIT – I**

**Concrete making materials** – Cement, mineral additives, aggregates, water, admixtures. Types of structural steel and their properties. Batching plant and equipment, types of mixers, transportation, pumping and placing of concrete, nominal mixes and design mixes, Design codes and handbooks.

**Properties of hardened concrete:** Effects of water cement ratio, compaction, age, curing on strength of concrete. Compressive strength, grades of concrete, bond strength, shrinkage and creep, durability, chemical attack, sulphate attack, resistance to abrasion, resistance to fire, marine atmosphere.

**Structural Masonry:** Behavior of Load bearing Masonry Wall, Introduction of Reinforced Masonry and analysis of lintel beams.

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

**UNIT – II**

Reinforced concrete design philosophies, Working stress design, Concept of limit states. Limit states design, partial safety factors. Codal recommendations. Characteristic and design values, Factored loads, design stress strain curves.

**Limit state of Collapse:** Flexure, Shear, bond and torsion, Compression, Limit state of Serviceability.

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

**UNIT – III**

Analysis and design of singly and doubly reinforced simply supported cantilever and continuous beams and flanged beam section, lintels, Design principles of retaining walls.

Design of simply supported, cantilever slabs, one way and two way slabs.

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

**UNIT – IV**

Design of short and slender columns under axial load, under uniaxial and biaxial bending and shear force.

Design of isolated footing for vertical load and Moment, Design of combined footings.

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

**Text Books:**

- [T1] Sinha S.N., “ Handbook of Reinforced Concrete Design”, McGraw Hill Publishing Company., New Delhi.
- [T2] Gambhir M.L., “Fundamentals of Reinforced Concrete Design”., PHI Learning (P) Ltd., New Delhi.

**Reference Books:**

- [R1] Jain A.K., “Limit State Design of Reinforced Concrete Structures”., Nem Chand Publishers, Roorkee.
- [R2] Shetty M.S., “Concrete Technology, Theory and Practice”, S.Chand and Co., New Delhi.
- [R3] Raju K., “Reinforced Concrete”, New Age International (P) Ltd., New Delhi.
- [R4] Varghese P.C., “Limit State Design of Reinforced Concrete”, PHI (P) Ltd., New Delhi
- [R5] SanthaKumar A.R., “Concrete Technology”, Oxford Publications., New Delhi
- [R6] Unikrishna Pillai S., “Reinforced Concrete Design”., Tata McGraw Hill Publishing Company Ltd., New Delhi.

**CEMENT AND CONCRETE TESTING LAB**

**Paper Code: ETCE-252**

**Paper: Cement and Concrete Testing Lab**

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

**Note:** Based on theory 8-10 experiments are to be performed. The list is provided below:

**LIST OF EXPERIMENTS**

1. To determine the quantity of water for cement paste for normal consistency
2. To determine initial and final setting time of cement
3. To determine the fineness, specific gravity and unit weight of cement
4. Determination of tensile and compressive strength of cement
5. To determine fineness modulus of fine and coarse aggregate
6. To determine compressive strength of nominal mix concrete of a given grade
7. To determine the modulus of rupture of concrete
8. Workability of concrete by various methods
9. To determine the split tensile strength of concrete of given mix proportion
10. To determine the percentage bulking of fine aggregate
11. To determine soundness of given cement by Le-Chatelier method
12. Effect of water cement ratio on strength of concrete
13. Concrete mix design

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**

GURU GOBIND SINGH  
INDRAPRASTHA  
UNIVERSITY

**STRUCTURE LAB****Paper Code: ETCE-254****L T/P C****Paper: Structure Lab****0 2 1**

**Note:** Based on theory 8-10 experiments are to be performed. The list is provided below:

**LIST OF EXPERIMENTS**

1. To find the value of flexible stiffness  $EI$  for a given beam and comparison with theoretical value
2. To verify the moment area theorem
3. To study the behavior of different types of columns
4. To verify the Clark's Maxwell reciprocal theorem
5. To determine the horizontal thrust in a three hinged arch and verify it
6. To determine the elastic displacement of curved members and verify it
7. To obtain the influence line diagram for horizontal thrust in a three hinged arch and verify it
8. To find the value of torsional constant and compare it with theoretical value

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**



GURU GOBIND SINGH  
INDRAPRASTHA  
UNIVERSITY

**HYDRAULICS LAB****Paper Code: ETCE-256****Paper: Hydraulics Lab**

L	T/P	C
0	2	1

**Note:** Based on theory 8-10 experiments are to be performed. The list is provided below:

**LIST OF EXPERIMENTS**

1. To study and compare the losses due to flow in smooth and rough pipes
2. To draw the performance characteristics of variable speed centrifugal pump
3. To draw the performance characteristics of single stage reciprocating pump
4. To determine operating characteristics of pelton wheel turbine
5. To determine operating characteristics of Francis turbine
6. To determine operating characteristics of Kaplan turbine
7. To determine the coefficient of impact for different types of vanes
8. Reynolds dye experiment for flow characterization
9. Model studies
10. Pipe analysis using EPANET software

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**

GURU GOBIND SINGH  
INDRAPRASTHA  
UNIVERSITY

**ADVANCED SURVEYING LAB**

Paper Code: ETCE-258

Paper: Advanced Surveying Lab

L	T/P	C
0	2	1

Based on theory course ETCE 208, 8-10 experiments are to be performed.

NOTE:- At least 8 Experiments out of the list must be done in the semester.





**SEMINAR****Paper Code: ETCE-260****Paper: Seminar**

L	T/P	C
0	2	1

**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 are essential for an engineer. Individual students are required to choose a topic of their interest from the syllabus of second year (i.e. 3<sup>rd</sup> and 4<sup>th</sup> semester) and give a seminar on at least two topics 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 copy of a write up of the seminar topic.



**COMMUNICATION SKILLS FOR PROFESSIONALS**

**Paper Code: ETHS-301**

**L T/P C**

**Paper: Communication Skills for Professionals**

**2 0 1**

**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.

*Objective: To develop communication competence in prospective engineers so that they are able to communicate information as well as their thoughts and ideas with clarity and precision. This course will also equip them with the basic skills required for a variety of practical applications of communication such as applying for a job, writing reports and proposals. Further, it will make them aware of the new developments in communication that have become part of business organisations today.*

**UNIT I**

**Organizational Communication:** Meaning, importance and function of communication, Process of communication, Communication Cycle - message, sender, encoding, channel, receiver, decoding, feedback, Characteristics, Media and Types of communication, Formal and informal channels of communication, 7 C's of communication, Barriers to communication, Ethics of communication (plagiarism, language sensitivity)

**Soft Skills:** Personality Development, Self Analysis through SWOT, Johari Window, Interpersonal skills -Time management, Team building, Leadership skills. Emotional Intelligence. Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, Career planning, Self esteem.

[T1,T2][No. of Hrs. 08]

**UNIT II**

**Introduction to Phonetics:** IPA system (as in Oxford Advanced Learner's Dictionary), Speech Mechanism, The Description of Speech Sounds, Phoneme, Diphthong, Syllable, Stress, Intonation, Prosodic Features; Pronunciation; Phonetic Transcription - Conversion of words to phonetic symbols and from phonetic symbols to words. British and American English (basic difference in vocabulary, spelling, pronunciation, structure)

**Non-Verbal Language:** Importance, characteristics, types – Paralanguage (voice, tone, volume, speed, pitch, effective pause), Body Language (posture, gesture, eye contact, facial expressions), Proxemics, Chronemics, Appearance, Symbols.

[T1,T2][No. of Hrs. 08]

**UNIT III**

**Letters at the Workplace** – letter writing (hard copy and soft copy): request, sales, enquiry, order, complaint. Job Application -- resume and cover letter

**Meeting Documentation**-- notice, memo, circular, agenda and minutes of meeting.

**Report Writing** - Significance, purpose, characteristics, types of reports, planning, organizing and writing a report, structure of formal report. Writing an abstract, summary, Basics of formatting and style sheet (*IEEE Editorial Style Manual*), development of thesis argument, data collection, inside citations, bibliography; Preparing a written report for presentation and submission. Writing a paper for conference presentation/journal submission.

[T1,T2][No. of Hrs. 08]

**UNIT IV**

**Listening and Speaking Skills:** Importance, purpose and types of listening, process of listening, difference between hearing and listening, Barriers to effective listening, Traits of a good listener, Tips for effective listening. Analytical thinking; Speech, Rhetoric, Polemics; Audience analysis. Telephone Skills - making and receiving calls, leaving a message, asking and giving information, etiquettes.

**Presentations:** Mode, mean and purpose of presentation, organizing the contents, nuances of delivery, voice and body language in effective presentation, time dimension.

**Group Discussion:** Purpose, types of GDs, strategies for GDs, body language and guidelines for group discussion.

**Interview Skills:** Purpose, types of interviews, preparing for the interview, attending the interview, interview process, employers expectations, general etiquettes.

[T1,T2][No. of Hrs. 07]

**Text Books:**

- [T1] Anna Dept. Of English. Mindscapes: English for Technologists and Engineers PB. New Delhi: Orient Blackswan.
- [T2] Farhathullah, T. M. Communication Skills for Technical Students. Orient Blackswan, 2002.

**References Books:**

- [R1] Masters, Ann and Harold R. Wallace. Personal Development for Life and Work, 10th Edition. Cengage Learning India, 2012.
- [R2] Institute of Electrical and Electronics Engineers. IEEE Editorial Style Manual. IEEE, n.d. Web. 9 Sept. 2009.
- [R3] Sethi and Dhamija. A Course in Phonetics and Spoken English. PHI Learning, 1999.
- [R4] Khera, Shiv. You Can Win. New York: Macmillan, 2003.



**ADVANCED STRUCTURAL ANALYSIS****Paper Code: ETCE-303****Paper: Advanced Structural Analysis**

<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: This course covers advance topics such as structural response of arches, curved beams. The course also deals with use of basic principles of matrix method such as flexibility and stiffness method for analysis of structures. The course also involves introduction to FEM software package.*

**UNIT I**

**Arches :** Theory of arches, Eddy's theorem, Circular , parabolic and geometric arches, concept of radial shear force and axial thrust, analysis of three hinged and two hinged arches, Effect of yielding of supports, rib shortening and temperature changes, tied arches, ILD for 3 hinged arches.

**Curved Beams:** plan and elevation, beams on elastic foundations.

**[T1][No. of Hours: 10]****UNIT II**

**Basic Principles of Matrix Method:** Types of framed structures, Deformations, Equilibrium, Compatibility, Static and Kinematic Indeterminacy, Flexibility and Stiffness matrices, Equivalent joint loads, Energy concepts, Principle of virtual work.

**Matrix analysis of structures:** Force and displacement methods of analysis, definition of flexibility and stiffness influence coefficients.

**[T2][No. of Hours: 11]****UNIT II**

**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.

**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.

**[T1,T2][No. of Hours: 12]****UNIT III**

**Direct stiffness method :** Introduction, element stiffness matrix, rotation transformation matrix, transformation of displacement and load vectors and stiffness matrix, equivalent nodal forces and load vectors, assembly of stiffness matrix and load vector, determination of nodal displacement and element forces, analysis of plane truss, plane frame [with numerical examples], analysis of grid, space truss and space frame [without numerical examples].

**Computer implementation:** A project on development of an analysis program using some of the above method is envisaged at this stage, Introduction to FEM package.

**[T1,T2][No. of Hours: 12]****Text Books:**

- [T1] S. Rajasekaran, "Computational Structural Mechanics", Prentice-Hall India.  
 [T2] Pandit and Gupta, "Structural Analysis a Matrix Approach" Tata Mc Graw Hill

**References:**

- [R1] C.K. Wang, "Matrix methods of structural analysis", International Textbook Company.  
 [R2] Przemieniecki, "Theory of Matrix structural Analysis", Mc Graw Hill.  
 [R3] Weaver and Gere, "Matrix Analysis of Framed structures", CBS Publishers.  
 [R4] S.S.Bhavikatti, "Structural Analysis-Vol-2, Vikas Publishing House.  
 [R5] Devadas Menon, "Structural Analysis", Narosa Publishing  
 [R6] Structural Analysis, Hibbeler, Pearson Education

**DESIGN OF STEEL STRUCTURE**

**Paper Code: ETCE-305**  
**Paper: Design of Steel Structure**

<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:** To provide a basic understanding of use of steels in civil engineering, and to develop technical competence in the design of simple bolted and welded connections, tension and compression members, beams and plate girders. The course also deals with plastic analysis of structures.*

**UNIT I**

**Introduction:** Types of steel structures like industrial buildings, beams/truss/arch/ suspension bridges, Beam and column framing, Rolled steel section, Advantages of steel as a structural material. Introduction to working stress and limit state theories, Type of sections, Connections and frames.

**Riveted connections:** Analysis and design of various types of riveted connections, permissible stresses in rivets, Design criteria, Code requirements, Tacking rivets, rivet joints subject to moment, Stresses in rivets.

**Welded connections:** Advantage and disadvantages of welding, Design criteria, Code requirements, Analysis and design of Fillet and Butt weld, Fillet weld subjected to moment.

**Design of Tension members:** Analysis of trusses and design of axially loaded tension member, Lug angle, tension splice.

[T1][No. of Hours: 12]

**UNIT II**

**Design of compression members:** Modes of failure in column, Design of compression member, Lacing and battening for built up compression member. Compression member composed of two components back-to-back, column base and foundation, Roof trusses [including Purlins, bracings and connections].

[T1][No. of Hours: 11]

**UNIT III**

**Design of flexural members:** Beam, Plate girder, Gantry girder including lateral and flexural torsional building, design of structural elements.

[T2][No. of Hours: 11]

**UNIT IV**

**Plastic Analysis of structures:** Moment curvature relationship, shape factor, plastic hinges, upper and lower bounds.

**Analysis and Design of Steel Frames:** Analysis and Design of frames as per codal recommendations.

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

**Text Books:**

[T1] S.K. Duggal, "Limit State Design of steel structures", Tata Mc Graw Hill

[T2] L.S. Negi, "Design of steel structures", Tata Mc Graw Hill

**References**

[R1] N. Subramanian, "Design of steel structures", Oxford University Press.

[R2] Krishnamurthy, "Elementary Structural Design"-Vol-III, CBS Publishers

[R3] Elias G. Abu-Saba, "Design of steel structures", CBS Publication

[R4] John E. Lothers. "Design of steel structures", Prentice-Hall

**ENGINEERING HYDROLOGY****Paper Code: ETCE-307****Paper: Engineering Hydrology**

<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:**

1. To introduce students to various methods of estimation and analysis, precipitation and abstraction from rainfall and stream flow.
2. Assessment of stream flow and design principles of Dams, Weirs and Barrage, estimation of all parameters and characteristics related to hydrological aspects of catchment studies.

**UNIT I**

**Introduction:** Importance of Hydrology in relation to water resources development, Hydrology cycle, climatic and meteorological aspects, Water budget equation, Applications of hydrology in engineering.

**Precipitation:** Types, measurements, rain gauges, errors in measurements, check for consistency, missing data, Areal mean, mass curves, intensity duration frequency curves, depth area duration curves, and rainfall distribution in India.

**Abstractions from Precipitation:** Evaporation, measurements, empirical equation and analytical methods for evaporation estimation, Reservoir evaporation and methods for its reduction, Transpiration, Evapo-transpiration, Interception, Depression storage, Infiltration process and measurements, Infiltration capacities, Horton's equation, Infiltration indices.

**[T1,T2][No. of Hours: 12]****UNIT II**

**Stream flow measurement:** Measurement of stage and velocity, Area velocity method, chemical and Tracer method, Electromagnetic and ultrasound method, indirect methods, Stage discharge relationships.

**Runoff :** Runoff characteristic of streams, Rainfall-runoff correlation, Empirical equations, flow duration curve, flow mass curve, calculation of storage / maintainable demand, Sequent peak algorithm, Droughts, causes and management.

**[T1,T2][No. of Hours: 10]****UNIT III**

**Hydrographs :** Hydrograph and its components, Factors affecting flood hydrograph, components of hydrograph, basic flow separation techniques, effective rainfall, Unit hydrographs, concept of time invariance and linear response, Applications and derivation of unit hydrographs, complex storm, Unit hydrograph of different durations, methods of superposition and S-curve, Synthetic unit hydrograph, dimensionless unit hydrograph, Instantaneous unit hydrograph, Uses and limitations of unit hydrographs.

**[T1,T2][No. of Hours: 10]****UNIT IV**

**Floods:** Computations of peak floods by empirical formulae, by rational method and by unit hydrograph method, CWC recommendations for design flood values, flood estimation by Gumbel's Method, flood routing principles, reservoir routing, Floods in major Indian rivers, Flood damage, causes and remedial measures

**Ground Water Hydraulics:** Sources of ground water, flow through porous media, Energy and momentum concepts applied to groundwater flow, groundwater storage and derivation of the mass balance equation, potential and stream functions, Characteristics of wells and their yield, recharging ground water.

**[T2][No. of Hours: 12]****Text Books:**

- [T1] K. Subramanya , "Engineering hydrology" , Tata Mc Graw Hill.  
 [T2] Elementary Engineering Hydrology, Deodhar, Pearson Education

**References Books:**

- [R1] Chow, Maidment and Mays, "Applied Hydrology", Mc Graw Hill.  
 [R2] D.K.Todd , "Gound water hydrology", John Wiley India Edition.  
 [R3] Manning, "Applied Principles of Hydrology", CBS.

- [R4] Wurbs, “Water Resource Engineering”, Prentice Hall India.  
[R5] H. M. Raghunath 2006, Hydrology: Principles, Analysis and Design, New Age International Publisher  
[R6] S.K. Garg, “Hydrology and Water Resources Engineering”, Khanna Publishers.



**GEOTECHNICAL AND FOUNDATION ENGINEERING**

**Paper Code: ETCE-309**

**Paper: Geotechnical and Foundation Engineering**

<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.

***Objectives:** 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.*

**UNIT I**

**Sub surface exploration:** Types of soil and rock sample, Indirect, direct and semidirect 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][No. of Hours: 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

**Caissons:** Types, uses and construction procedures.

[T2][No. of Hours: 12]

**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; Concept of Arching of soils and braced cuts.

**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, Braced excavations.

[T1,T2][No. of Hours: 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.

**Environmental Geotechnology:** Environmental and Natural cycles, Environmental imbalance, contaminated soils, Load environment design criteria.

[T1,T2][No. of Hours: 10]

**Text Books:**

[T1] R. B. Peck and Terzaghi, "Soil Mechanics in Engineering Practice", John Wiley

[T2] V.N.S. Murthy, "Soil Mechanics and Foundation Engineering", CBS

**References Books:**

[R1] Shashi K. Gulati and Manoj Datta, "Geotechnical Engineering", Tata Mc Graw 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" Norsa Publisher



- [R5] Braja M. Das, Principles of Foundation Engineering, Cengage Learning  
[R6] P.C. Verghese, "Foundation Engineering" PHI Learning Pvt. Ltd.  
[R7] Karuna Moy Ghosh, "Foundation Design in Practice" PHI Learning Pvt. Ltd.  
[R8] Nihar Ranjan Patra, "Ground Improvement Techniques", Vikas Publishing House Pvt. Ltd.



**WASTEWATER ENGINEERING AND REUSE**

**Paper code: ETCE-311**

**Paper: Wastewater Engineering and Reuse**

<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:** The course deals with planning of sewerage collection and treatment processes such as attached culture system, suspended culture system. The subject also deals with nutrient removal, sludge thickening, sludge digestion.*

**UNIT I**

**Sewerage systems and their components:** Introduction to sewerage system, Estimation of sewerage and drainage discharge, Dry weather flow, capacity of sewers, self cleansing and non scouring velocities, calculations of sizes and grades, forms and cross sections of sewers, hydraulic characteristics of circular sewer sections, use of tables and monograms, egg shaped sewers, systems of drainage, separate, combined and partially combined systems.

**Quality and characteristics of sewage:** physical, chemical and biological characteristics of sewage, Aerobic and anaerobic decomposition of sewage, nitrogen, sulphur and carbon cycles, collection of sewage sample, bacteriological and virological testing.

**Sewage disposal:** Disposal of treated / untreated / partially treated effluents in natural water bodies, Standard for effluent disposal on land, Disposal by land treatment / sewage farming methods, sewage sickness and its preventive measures, Treatment standards for sewage effluents, Bangalore and Indore methods of disposal.

[T1][No. of Hours: 12]

**UNIT II**

**Engineered systems for waste water treatment:** Types of treatment units in preliminary, primary and secondary treatment, their functions and efficiencies, analysis and design of screening, grit chambers, detritus tanks, skimming tanks, design of septic tanks and Imhoff tanks.

**Ponds and lagoons:** Principle, operations, construction, design and detailing of Oxidation ponds, Aerated lagoons, Facultative ponds, Oxidation ditches, Anaerobic lagoons.

**Attached culture systems:** System microbiology, Contact beds, Principle, operations, Construction and design details of Trickling filters, Bio towers, Rotating biological contractors (RBC).

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

**UNIT III**

**Design of Suspended culture systems :** Activated sludge, concept of completely mixed and Plug flow reactors, process variation and design considerations, Aeration of activated sludge, Air diffusers and mechanical aerators, activated sludge clarifiers, Secondary clarifier design based on limiting flux rate.

**Advanced waste water treatment:** Nutrient removal, Nitrification and denitrification, Air stripping for ammonia removal, phosphorus removal, dissolved solids removal, Waste water reuse.

**Sludge thickening and sludge digestion:** Sludge characteristics, sludge volume and solids relationships, Aerobic and anaerobic digestion, Factors affecting sludge digestion and their control, disposal of digested sludge.

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

**UNIT IV**

**Sewage collection from houses and buildings:** General principles for design of sanitary plumbing system, Functions and types of traps, types of plumbing systems, one pipe / two pipe, single stack / partially ventilated single stack system, .

**Construction and maintenance of sewers:** Forces acting on sewer pipes, materials used in construction, laying and testing of sewer pipes, sewer appurtenances such as manholes, street inlets, gullies, catch basins, grease and oil traps, storm water overflows, inverted siphons, flushing and ventilation of sewers, Pumps for lifting sewage.

[T1,T2][No. of Hours: 10]

**Text Books:**

[T1] S.K.Garg, "Sewage Disposal and Air Pollution Engineering", Khanna Publishers

[T2] Venugopala Rao, "Principles of Environmental Science and Engineering", Prentice Hall India

**References:**

- [R1] Davis and Cornwell, "Introduction to Environmental Engineering", McGraw Hill  
[R2] Peavy, Rowe and Tchobanoglous, "Environmental Engineering", McGraw Hill  
[R3] Amal K. Dutta, "Introduction to Environmental Science and Technology", Oxford and IBH  
[R4] Kiely, "Environmental Engineering" Tata McGraw Hill  
[R5] Henry and Heinke, "Environmental Science and Engineering", Prentice Hall India



**COMMUNICATION SKILLS FOR PROFESSIONALS LAB**

<b>Paper Code: ETHS-351</b>	<b>L</b>	<b>T/P</b>	<b>C</b>
<b>Paper: Communication Skills for Professionals Lab</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Objective:** To develop communication competence in prospective engineers so that they are able to communicate information as well as their thoughts and ideas with clarity and precision. These activities will enhance students' communication skills with a focus on improving their oral communication both in formal and informal situations. They will develop confidence in facing interviews and participating in group discussions which have become an integral part of placement procedures of most business organisations today.

**Lab Activities to be conducted:**

- 1. Listening and Comprehension Activities** – Listening to selected lectures, seminars, news (BBC, CNN, etc.). Writing a brief summary or answering questions on the material listened to.
- 2. Reading Activities** -- Reading different types of texts for different purposes with focus on the sound structure and intonation patterns of English. Emphasis on correct pronunciation.
- 3. Conversation Activities**-- Effective Conversation Skills; Formal/Informal Conversation; Addressing higher officials, colleagues, subordinates, a public gathering; Participating in a video conference.
- 4. Making an Oral Presentation**–Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Connecting with the audience during presentation; Projecting a positive image while speaking; Emphasis on effective body language.
- 5. Making a Power Point Presentation** -- Structure and format; Covering elements of an effective presentation; Body language dynamics.
- 6. Making a Speech** -- Basics of public speaking; Preparing for a speech; Features of a good speech; Speaking with a microphone. Famous speeches may be played as model speeches for learning the art of public speaking. Some suggested speeches: Barack Obama, John F Kennedy, Nelson Mandela, Mahatma Gandhi, Jawahar Lal Nehru, Atal Bihari Vajpayee, Subhash Chandra Bose, Winston Churchill, Martin Luther King Jr.
- 7. Participating in a Group Discussion** -- Structure and dynamics of a GD; Techniques of effective participation in group discussion; Preparing for group discussion; Accepting others' views / ideas; Arguing against others' views or ideas, etc.
- 8. Participating in Mock Interviews** -- Job Interviews: purpose and process; How to prepare for an interview; Language and style to be used in an interview; Types of interview questions and how to answer them.

**Suggested Lab Activities:**

1. Interview through telephone/video-conferencing
2. Extempore, Story Telling, Poetry Recitation
3. Mock Situations and Role Play; Enacting a short skit
4. Debate (Developing an Argument), News Reading and Anchoring.

**Reference Books:**

1. Patnaik, Priyadarshi. *Group Discussion and Interview Skills: With VCD*. Cambridge University Press India (Foundation Books), 2012 edition.
2. Kaul, Asha. *Business Communication*. PHI Learning: 2009.
3. Hartman and Lemay. *Presentation Success: A Step-by-Step Approach*. Thomson Learning, 2000.

**Note:** The Communication Skills Lab should be equipped with computers, microphones, an internet connection, overhead projector, screen, sound system, audio/video recording facilities, and seating arrangement for GDs and mock interviews. The student activities may be recorded and students may replay them to analyse and improve their pronunciation, tone, expressions, body language, etc.

Traditional language lab softwares are not mandatory and may be used by students to practice and enhance their language competence. Such softwares are usually elementary in nature and are mostly based on British/American English (pronunciation, accent and expression). They should preferably be in Indian English.

**GEOTECHNICAL ENGINEERING LAB****Paper Code: ETCE-353****Paper: Geotechnical Engineering Lab**

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

**Note:** Based on theory 8-10 experiments are to be performed. The list is provided below:

**LIST OF EXPERIMENTS**

1. Moisture content determination by oven drying method, pycnometer method, and rapid moisture meter
2. Specific Gravity of soil particles by Pycnometer method and Density Bottle method
3. Particle size distribution of soils [Grain size analysis] by Sieve analysis and Hydrometer analysis.
4. Atterberg's limits [liquid Limit, Plastic Limit and Shrinkage Limit] tests
5. Field density tests of soils by Core cutter method and sand replacement method
6. Permeability tests of soils by Variable head method and Constant head method
7. Soil compaction test [Density moisture relations]
8. Consolidation test
9. Triaxial compression test
10. Unconfined compression test
11. Direct shear test
12. Plate load test

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**



**WATER AND WASTEWATER ANALYSIS LAB****Paper Code: ETCE-355****Paper: Water and Wastewater Analysis Lab**

L	T/P	C
0	2	1

**Note:** Based on theory 8-10 experiments are to be performed. The list is provided below:

**LIST OF EXPERIMENTS**

1. To determine pH, turbidity, electrical conductivity of the given sample.
2. To determine the total hardness, calcium and magnesium in the given sample.
3. To find the amount of Fluoride, Sulfate, iron and manganese in the given sample.
4. To determine the optimum coagulant dose quantity for given sample of raw water.
5. To determine chlorine demand and residual chlorine.
6. To determine most probable number [MPN] of coli-forms of the given sample.
7. To determine the solids [total, suspended and dissolved] of the given sample.
8. To find out total settle-able solids [by Imhoff Cone] in the given wastewater sample.
9. To estimate the amount of dissolved oxygen present in the given wastewater sample.
10. To estimate the value of biochemical oxygen demand [BOD] in the given water sample/sewage sample.
11. To find out chemical oxygen demand [COD] of the given wastewater sample.
12. Field visit of water/sewage treatment plant.

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**



**SEMINAR ON CIVIL ENGINEERING PROJECTS / VISITS / CASE STUDIES**

**Paper Code: ETCE-357**

**L T/P C**

**Paper: Seminar on Civil Engineering projects / Visits / Case Studies**

**0 2 1**

**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 are essential for an engineer. Students are required to give a seminar on Civil Engg. 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 copy of a write up of the seminar topic.



**SOFTWARE TRAINING****Paper Code: ETCE-359****Paper: Software Training**

L	T/P	C
0	2	1

Minimum of two weeks model/software training related to Civil Engg., is to be held after 4<sup>th</sup> Semester. Further weekly presentations and viva-voce will be conducted in this semester.





**APPLICATIONS OF REMOTE SENSING AND GIS**

**Paper Code: ETCE-304**

**Paper: Applications of Remote Sensing and GIS**

<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:** To understand the principles of remote sensing and digital image processing, GIS, such as assessment of cyclone, rainfall, atmospheric humidity etc., and Gain experience in the use of image processing and GIS software.*

**UNIT I**

Introduction, concepts and physical basis of Remote Sensing, Electromagnetic spectrum, radiation laws, atmospheric effects, image characteristics.

Remote sensing systems; sources of remote sensing information, spectral quantities spectral signatures and characteristics spectral reflectance curves for rocks, soil, vegetation and water.

Introduction to Aerial and space borne platforms.

Global positioning system (GPS) photogrammetry – analog, analytical and digital photogrammetry, height and plan metric.

[T1][No. of Hours 11]

**UNIT II**

Optical, thermal and microwave sensors and their resolution, salient features of some of operating Remote Sensing satellites,

Digital image processing; introduction, image rectification and restoration, image enhancement, manipulation, image classification, fusion.

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

**UNIT III**

GIS system : Definition terminology and data types, Map projection and Co-ordinate system, basic components of GIS software, data models, data acquisition, both raster based and vector based data input and data processing and management including topology, overlaying and integration and finally data product and report generation, principle of cartography and cartographic design.

GIS customization concepts, approaches of Multi-criteria decision making, concepts and applications of Geostatistics.

[T1][No. of hours 12]

**UNIT IV**

Application of Geo-spatial technology in Civil Engineering, assessment of cyclones, rainfall, atmospheric humidity etc., weather analysis, forecasting and modelling.Land use, inventory and monitoring, urban planning, snow and glaciers, coastal zone management, air and water pollution, commercially available remote sensing and GIS software.

[T2][No. of hours 11]

**Text Books:**

- [T1] Chang K.T., "Introduction to Geographic Information System", Tata McGraw Hill Education (P) Ltd.,  
 [T2] John R.Jensen, "Remote Sensing of the Environment", Pearson Education

**Reference Books:**

- [R1] Clarke K.C., Parks B.O., Crane M.P., "GIS and Environmental Modeling", PHI Learning (P) Ltd., ND  
 [R2] Lillesand T.M. and Kiefer R.W., "Remote Sensing and Image Interpretation", John Wiley and Sons, NY  
 [R3] Lo C.P. and Yeung A.K.W., "Concept and Techniques of Geographic Information Systems", PHI  
 [R4] Chakraborty D. and Sahoo R.N., "Fundamentals of Geographic Information System", Viva Books, ND.  
 [R5] Joseph G., "Fundamentals of Remote Sensing", University Press (India) Ltd., Hyderabad.  
 [R6] L.R.A. Narayan, "Remote Sensing and its Applications", University Press.

**QUANTITY SURVEYING AND COST ESTIMATION**

**Paper Code: ETCE-306**

**Paper: Quantity Surveying and Cost Estimation**

<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:** To learn the fundamentals of estimation of different types of civil engineering structures, analysis of rates and valuation concepts. The course also deals with different method of depreciation and valuation of properties including case studies.*

**UNIT-1**

**Estimating Principle:** Method of estimating, Main items of work, Deduction for openings, R.C.C. and R.B. work, Estimation for Flooring, Roofing, Plastering, Pointing Cornice, Doors, Windows, Wood Work, Iron Work, Aluminum work and Lump sum items

**Earthwork Calculations:** Calculation of areas, Measurement of earthwork, Determination of Earthwork for reservoirs from contour map.

[T1][No. of Hours: 11]

**UNIT-II**

**RCC works and Structure:** Estimate of RCC Slab, beam, T beam, Column with foundation, staircase, retaining wall etc.

**Road Estimating:** Earthen, WBM and RCC roads, Premix carpeting, Stabilized soil road, Modernization of a road.

[T2][No. of Hours: 11]

**UNIT-III**

**Analysis of Rates for building work:** Purpose and principal factors affecting the rate of an item of work, overhead costs, Materials for brick masonry, stone masonry, cement concrete, cement mortar, Plastering, different types of flooring, floor finish, color washing, distemper, varnish, painting, items for sanitary work, wood work, preparing analysis of rates.

**Analysis of Rates for Road works:** Bituminous painting 1st and 2nd coats, Premix carpet, bituminous macadam, Laying and Consolidation of stone metal and Kankar material. Itemized rates as per DSR [Delhi Schedule of Rates.

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

**UNIT –IV**

**Depreciation:** Different methods of calculating depreciation-straight line method, declining balance method, sinking fund method, quantity Survey method, Depreciated Cost, Case Studies

**Valuation:** Cost of engineering services, rent fixation, valuation of properties, methods of valuation, book value, market value, profit and loss, scrap value, salvage value, Evaluation of projects, Annual cost method, rate of return method, benefit cost ratio method, Case Studies.

[T1,R5][No. of Hours: 12]

**Text Books:**

[T1] B. N. Dutta- Estimating and costing in Civil Engg. UPSPD.

[T2] M .Chakraborty, “Estimating costing and Specifications in Civil Engg”,

**References:**

[R1] D.S.R. [Delhi Schedule Rates] C.P.W.D

[R2] PWD Account Code

[R3] Samuelson and Nardhaus-Economics, Mc Graw Hill

[R4] ‘Text book of Estimating and Costing’ by G.S.Birdie

[R5] ‘Civil Engineering Building Drawing’ by Gurucharan Singh

**OPEN CHANNEL, FLOW AND NUMERICAL HYDRAULICS**

**Paper Code: ETCE-308**

**L T/P C**

**Paper: Open Channel, Flow and Numerical Hydraulics**

**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:** To introduce the concepts of channel hydraulics. The contents of the course are applicable in design of inland waterways needed for irrigation, navigation etc., the course also deals with finite volume approach for convection, diffusion and transport problems.*

**UNIT I**

**Flow in open channels:** Type of channels, classification of flows, continuity energy and momentum equation, concept of critical depth and specific energy, critical depth for rectangular, triangular, circular and trapezoidal channels, flow through transition with a hump and with change in width (contraction and expansion).

**Uniform flow:** Chezy's equation, Manning's formula, Factors affecting Manning's roughness coefficient, velocity distribution, shear stress distribution, Uniform flow computations for rectangular, trapezoidal and circular channels, standard line canal channels, Hydraulically efficient channel sections, compound sections, Critical slope and limit slope, Design of irrigation canals.

**[T1,R1][No. of Hours: 12]**

**UNIT II**

**Gradually Varied Flow:** Classification of flow profiles, M, S, C, H and A profiles, control sections, serial combination of channel sections, Transitional depth, numerical solution of gradually varied flow problems.

**Hydraulic jump:** Hydraulic jump in rectangular channel: sequent depth ratio, Energy loss; Classification of jumps, characteristics of jumps in rectangular channels, use of jump as an energy dissipater.

**[T2,R1] [No. of Hours: 11]**

**UNIT III**

**Sediment Transport :** Hydraulics of mobile bed channels, sediment load, bed load, suspended load, Design of stable channels carrying clear water using Critical Tractive Force Approach, Regime channels, Kennedy equation and Lacey's equations, Lining of irrigation canals, Design of lined irrigation canals.

**[T2,R3] [No. of Hours: 11]**

**UNIT IV**

**The finite volume Method for Diffusion Problems:** Introduction, one-dimensional steady state diffusion, two-dimensional diffusion problems, discretised equations for diffusion problems.

**The Finite volume Method for Convection-Diffusion Problems:** Steady one-dimensional convection and diffusion, The central differencing scheme.

**Basic mechanisms for mixing:** Laminar and turbulent diffusion, Dispersion and advection. Mixing in rivers, lakes and coastal waters.

**The general transport (advection-diffusion) equation:** Formulation and special cases, Transport processes and spreading of pollutant. Balance equations for water and pollutants in surface water systems.

**[T1,T2][No. of Hours: 11]**

**Text Books:**

- [T1] K. Subramanya, "Flow in Open Channels", Tata McGraw Hill  
 [T2] G.L. Aswa, "Fluid flow in pipes and Open Channel", CBS Publication

**References:**

- [R1] Chow, V.T., "Open Channel Hydraulics", McGraw Hill Book Company 1959  
 [R2] Asawa, G.L., "Flow of Fluids in Pipes and Channels", CBS Publishers, New Delhi 2007  
 [R3] H. K. Versteeg and W. Malalasekera, "An Introduction To Computational Fluid Dynamics: The Finite Volume Method", Longman scientific and technical publishers.  
 [R4] John D. Anderson, "Computational Fluid Dynamics: The Basics with an Applications", McGraw- Hill,  
 [R5] Vivek V. Ranade, Computational Flow Modeling For Chemical Reactor Engineering, Academic Press, San Diego.

**ADVANCED STRUCTURAL DESIGN****Paper Code: ETCE-310****Paper: Advanced Structural Design**

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: Develop professional level competence in the seismic design and detailing of concrete and steel structures, structural elements as well as design of commonly used prestressed concrete structures.*

**UNIT I**

**Introduction to Seismic design:** General principles of seismic design, Introduction to IS 1893 : 2002, Building equivalent static analysis, Vertical distribution of seismic forces and horizontal shears, dynamic analysis, design spectrum, Seismic weights, Modal combination, Load combinations and permissible stresses, Guidelines for earthquake resistant design, Ductile detailing for seismic design, Analysis for lateral Loads: Introduction to IS 875 Part-III.

**[T1][No. of Hours: 12]****UNIT II**

**Concrete structure design:** Design of elevated and underground water tanks as per IS: 3370 and IS: 1893 Part-V. Design of retaining walls, Design of Box culvert.

**[T2][No. of Hours: 12]****UNIT III**

**Prestressed concrete:** Need for prestressing, pre tensioning and post tensioning methods, Concept of load balancing and cable profile, End anchorage, losses of prestress, Design of pre-stressed concrete beams as per IS: 1343.

**[T1,T2][No. of Hours: 10]****UNIT IV**

**Steel structural design:** Design of elevated water tanks, Design of transmission and communication towers and design of gantry girder as per IS: 800.

**[T1,T2][No. of Hours: 10]****Text Books:**

- [T1] N. Krishna Raju, R.N.Pranesh, "Reinforced concrete Design", CBS Publishers  
 [T2] P.C.Verghese, "Advance Reinforced concrete Design" PHI Delhi

**References:**

- [R1] N. Krishna Raju, "Prestressed concrete", Tata McGraw Hill.  
 [R2] Arther H. Nilson, "Design of concrete structures", Tata McGraw Hill  
 [R3] Arya and Ajamani, "Design of steel structures", Nem Chand and Bros. Publishers  
 [R4] C. Syal and A.K. Goel, "Reinforced concrete structures", S. Chand.  
 [R5] Prestressed concrete, Pandit and Gupta, CBS  
 [R6] T.Y. Lin, Design of Prestressed Concrete Structures, Asia Publishing House, 1955.  
 [R7] Edward Nawy, Prestressed Concrete: A fundamental approach, prentice hall, New Jersey  
 [R8] BIS 1893 – 2002 and BIS 875 Part III  
 [R9] N.Krishna Raju, "Advance Reinforced concrete Design" CBS Publishers

**TRANSPORTATION ENGINEERING-I****Paper Code: ETCE-312****L T/P C****Paper: Transportation Engineering-I****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: To learn the fundamentals for alignment and geometric and pavement design of highway, various aspects of traffic engineering, highway construction materials, quality control and maintenance etc.*

**UNIT I**

**Highway Development and Alignment:** Scope of highway engineering, road development and planning in India, role of NHAI, classification of roads, types of road pattern, Planning and Engineering surveys, Highway alignment, Highway project financing and economics of urban roads, expressways, national and state highways.

**Highway geometric design:** Cross section, elements, width, camber, gradient, sight distance, requirements and design principles of horizontal and vertical alignment, Alignment and Geometrics of hill roads. Highway safety and safety audit.

**[T1,T2][No. of Hours: 11]****UNIT II**

**Traffic Engineering:** Traffic characteristics and operations, Traffic flow, Capacity and level of services for state highway, national highway and expressway, Design of traffic facilities: Intersection, Roundabout, interchanges, parking facilities road signs, Traffic control devices, parking requirements and design, Urban Transportation planning process, Highway lighting, Traffic signal, Traffic planning and Administration, Introduction of transportation demand analysis. Urban Transport systems, planning and design, Urban intersections, Traffic sections.

**[T1,T2][No. of Hours: 11]****UNIT III**

**Highway materials:** Properties of sub-grade and pavement component materials, Tests on sub grade soil, aggregates and bituminous materials, Bituminous paving mixes, Marshall Mix design criteria. Use of flyash, concrete and polymers in highway construction

**Pavement design:** Types of pavement [WBM, RCC, Prestressed CC etc], Factors influencing the design of flexible and rigid pavements, Methods of flexible and rigid pavement design, I.R.C codes and recommendations.

**Road side development:** Arboriculture, planning plantation of trees, species selection and care of trees.

**[T1,T2][No. of Hours: 12]****UNIT IV**

**Highway construction, technique and quality control:** Techniques of construction of rural, urban roads and expressways, Joints in cement concrete pavements, Design and construction of hill roads.

**Highway maintenance and Drainage:** Causes and types of Pavement failures, Pavement testing, monitoring and evaluation, strengthening of existing pavements, Surface and sub surface drainage, drainage of slopes and erosion control, drainage, maintenance problems on hill roads, road construction in water logged areas.

**[T1,T2][No. of Hours: 11]****Text Books:**

- [T1] Khanna and Justo, "Highway Engineering", Nem Chand and Bros. Publishers  
 [T2] Saxena, "Textbook of Highway and Traffic Engineering", CBS Publishers

**References:**

- [R1] I.S. specifications on concrete, aggregates and bituminous materials  
 [R2] David Croney, "Design and performance of road pavements", McGraw Hill  
 [R3] Wright Dixon, "Highway Engineering", Wiley India.  
 [R4] Dr. L. R. Kadiyali, "Traffic Engineering and Transport Planning", KP.  
 [R5] James H. Banks "Introduction to Transportation Engineering", McGraw Hill  
 [R6] R. Srinivasa Kumar, "Textbook of Highway Engineering", University Press.

**ENVIRONMENT SYSTEM OPTIMIZATION****Paper Code: ETEN-302****Paper: Environment System Optimization**

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: The course aims to introduce fundamentals and need for optimization techniques in engineering problems. Various techniques such as Linear Programming, Geometric Programming, Dynamic Programming and Non-Linear Programming are taught to students to solve various environmental engineering problems for optimal solutions.*

**UNIT-I**

**Introduction to Optimization:** Engineering Applications of Optimization, Statement of an Optimization Problem, Design Constraints, Constraint Surface, Objective Function, Optimization Techniques, Single-Variable Optimization, Multivariable Optimization with no Constraints, Multivariable Optimization with Equality Constraints, Multivariable Optimization with Inequality Constraints, Convex Programming Problem.

**[T1, T2][No. of Hours: 11]****UNIT-II**

**Linear Programming:** Applications, Standard form, Pivotal Reduction, Simplex Algorithm, Two Phases of the simplex Method, Primal- Dual Relations, Transportation Problem, Integer Linear Programming. Assignment Problem. Examples- reservoir for irrigation and power production, river water quality (including treated effluent component). Water supply and drainage network optimization- case study.

**[T1, T2][No. of Hours: 11]****UNIT-III**

**Geometric Programming:** Introduction, Polynomial, Unconstrained Minimization Problem, Constrained Minimization, Applications of Geometric Programming.

**Dynamic Programming:** Introduction, Multistage Decision Processes, Representation of a Multistage Decision Process, Concept of Sub-optimization and the principle of the Optimality, Computational Procedure in Dynamic Programming, Continuous Dynamic Programming, Design of a Minimum-Cost Drainage System. Water allocation problem, capacity expansion problem, reservoir operation, case study.

**[T1, T2][No. of Hours: 12]****UNIT-IV**

**Nonlinear Programming:** Unrestricted Search, Exhaustive Search, Dichotomous Search, Interval Halving Method, Golden Section Method, Interpolation Method, Quadratic Interpolation Method, Cubic Interpolation Method, Direct Root Method, Case studies in Environmental Engineering.

**[T1, T2][No. of Hours: 11]****Text Books:**

- [T1] Douglas A.H., "Environmental System Optimization", John Wiley and Sons, New York.  
 [T2] Vedula S. and Mujumdar P.P., "Water Resources Systems: Modeling Techniques and Analysis", TMH

**Reference Books:**

- [R1] Rao S.S., "Engineering Optimization- Theory and Optimization", New Age International Publishers  
 [R2] Haith D.A., "Environmental System Optimization", Wiley and Sons, New York.  
 [R3] Geem Z.W., "Optimization In Civil and Environmental Engineering", Old City Publishing, USA.  
 [R4] Sieniutycz S and Jezowski J., "Energy Optimization In Process Systems", Elsevier, U.K.  
 [R5] Floudas A and Pardalos M., "Encyclopedia of Optimization- Volume 2", Springer, United States.

**OPERATION RESEARCH AND MANAGEMENT**

**Paper Code: ETCE-302**

**Paper: Operation Research and Management**

<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:** To prepare students for technical careers and providing a strong foundation for engineering management positions. The subject also deals with concepts of Linear Programming, Geometric Programming, Dynamic Programming and problem formulation/solution of various engineering problems.*

**UNIT I**

Role of Project Manager, Project formulation and Cost Estimation, Project Financing, Economic Evaluation Criteria of the Project, Preparing a detailed project plan, Managing Risk and Uncertainty, Monitoring and Control during Project Execution, Monitoring the Project Interfaces, Project Communication and Documentation, Project Evaluation, Introduction to Bar Charts and Mile-Stone Charts, Introduction to Enterprise Resource Planning.

Engineering Application of Operational Research, Statement of an Optimization Problem, and Classification of Optimization Problems.

[T1][No. of Hours: 11]

**UNIT II**

Standard Form of Linear Programming, Simplex Algorithm, Two Phases of the Simplex Method, Duality in Linear Programming, Sensitivity of Post optimality Analysis, Transportation Problems, Assignment Model.

[T2] [No. of Hours: 12]

**UNIT III**

Deterministic Dynamic Programming, Classical Optimization Techniques, Unconstrained and Constrained Problems, Nonlinear Programming, Unconstrained Algorithm, Direct search Method, Gradient Method.

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

**UNIT IV**

General Management Concepts, Planning, Policy making, Programmes and Procedures, Staffing Technical Organizations, Models of Organization Development, Authority and Power, Delegation, Committees and Meetings, Technical, Administrative and Engineering Management, Manufacturing and System Management Human Resource Planning and Management, Motivation, Performance Management and Appraisal, Participative Management, Trade Unions, Organization and Management, Introduction to Material Management, Financial Management, Quality Management and Project management.

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

**Text Books:**

[T1] Hamdy A.Taha- Operations Research, Pearson Education, New Delhi.

[T2] Harvey M.Wagner-Principles of Operations Research- PHI, New Delhi

**References:**

[R1] Gary R.Heerkens -Project Managesment, Tata Mcgraw Hill Publication, New Delhi

[R2] Daniel L.Babacock-Managing Engineering and Technology- Lucy C. Morse, PHI, New Delhi

[R3] J David Hunger, Thomas L.Wheelen,- Essentials of Strategic Management- PHI, New Delhi

[R4] Engineering Optimization [Theory and practice] – Singiresu S.Rao, New Age, New Delhi.

[R5] A. K. Gupta,-Engineering Management , S.Chand and Company Ltd., New Delhi.

**DECISION SCIENCE**

**Paper Code: ETIT-302**  
**Paper: Decision Science**

<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 of 12.5 marks

*Objective: Skills acquired from this course will enable students to apply various decisions making and optimization techniques in solving problems pertaining to their respective areas of study.*

**UNIT- I**

Descriptive Statistics, Presentation of Data, Measures of Central Tendency and Variation, Probability-Concepts, Theorems, Bayes' Rule, Linear Programming, Formulation, Graphical and Simplex Method.

**[T1][R1] [No. of hrs. 10]****UNIT- II**

Decision Sciences and Role of quantitative techniques, Steps in decision making. Decision making under uncertainty, including optimism criterion, pessimism criterion, Laplace criterion, optimism criterion, Hurwicz criterion and Regret criterion. Decision making under risk, Multistage decision making, Multi criteria decision making. Posterior probabilities and Bayesian Analysis.

**[T1][T2][No. of hrs. 10]****UNIT- III**

**Game Theory:** Two person zero-sum games, concept of dominance, Pure and Mixed Strategy. Arithmetic, Algebraic, Matrix Algebra method. Solution by Dominance, Subgame and Linear programming method. Queuing Theory, Basic structure, Terminology, Classification, Birth and Death Process. Queuing Models upto 2 service stations.

**[T1][R1][No. of hrs. 12]****UNIT-IV**

Transportation Problems, Initial Basic Feasible Solution, Test for Optimality. Assignment problems. Network Analysis - PERT and CPM.

Network Models, Concept, Drawing network, identifying critical path, Calculating EST, LST, EFT, LFT, Slack and probability of project completion (CPM and PERT), Crashing of Network.

**[T1][R3][No. of hrs. 12]****Text Books:**

- [T1] Ken Black (2009) Business Statistics: For Contemporary Decision Making, 5th edition, Wiley-India.  
 [T2] Barry Render, RM Stair, ME Hanna and TN Badri (2009) Quantitative Analysis for Management, 10<sup>th</sup> edition, Pearson Prentice Hall.

**References Book:**

- [R1] Operations Research, H.A. Taha , Prentice-Hall India, 6<sup>th</sup> Edition, 2004

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**TRANSPORTATION ENGINEERING LAB**

**Paper Code: ETCE-352**

**Paper: Transportation Engineering Lab**

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

**Note:** Based on theory 8-10 experiments are to be performed. The list is provided below:

**List of Experiments:**

1. Aggregate crushing strength test.
2. Los Angeles Abrasion test.
3. Aggregate impact test.
4. Flakiness index and elongation index test.
5. Penetration test.
6. Ductility test.
7. Viscosity test.
8. Softening point test.
9. Flash and fire point test.
10. Determination of bitumen content by centrifuge extractor.
11. Determination of marshal stability value.
12. Determination of rebound deflection of pavement by Benkelman beam.

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**

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**APPLICATIONS OF REMOTE SENSING LAB****Paper code: ETCE-354****Paper: Applications of Remote Sensing Lab**

L	T/P	C
0	2	1

**List of Experiments:**

1. Introduction to basics of digital images and Data (Vector and Raster)
2. Interpretation of satellite images
3. Understanding the basic principles of Photogrammetry.
4. An introduction to image classification.
5. Interpreting RADAR images.
6. Extracting information from thermal remote sensing data.
7. Using GIS Software for plotting points, lines, polygons on maps.
8. Use of GIS in selection of Landfill site.
9. Note: Rest two experiments will be provided by the institute.

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**

**STRUCTURES DESIGN LAB****Paper Code: ETCE-356****Paper: Structures Design Lab**

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

**List of Experiments:**

1. Detailed design of structural elements of a multistory building [G+3 or more] as per recommendations of BIS: 1893-2002, BIS: 456-2000, BIS 13920:1993.
2. Design of Elevated and underground RCC water tank as per BIS:3370-1965
3. Design of Cantilever and counter-fort retaining walls
4. Design of box Culvert
5. Design of Pre-stressed concrete beams
6. Design of elevated steel water tank
7. Design of transmission line towers
8. Ductile detailing of structure elements and joints for seismic design as per BIS 13920:1993

Rest two experiments will be provided by the institute

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**



**ECONOMICS FOR ENGINEERS****Paper Code: ETCE-401****Paper: Economics for Engineers**

<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 of 12.5 marks

*Objective: The objective of this course is to give the working engineer an overview of the economics principles often employed in effective engineering decisions as related to the designing, planning and implementation of successful civil engineering projects.*

**UNIT – I**

Engineering economics and its definition, Nature and scope, Overview of Indian Financial Scenario. Utility, Theory of demand, law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply, Determination of equilibrium price under perfect competition. Time value of money-Simple and Compound Interest, Cash Flow Diagram, Principle of Economic Equivalence Evaluation of Engineering projects, Concept of Internal rate of return (IRR).

**[T1,T2] [No. of Hrs: 10]****UNIT – II**

Cost Concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into Fixed and variable costs, Break-even Analysis-Linear Approach. Engineering Accounting, Manufacturing Cost, Manufacturing Cost Estimation, Preparing Financial Business Cases, Profit and loss A/c Balance sheet. Asset Depreciation and its Impact on Economic Analyses, Depreciation Policy, Straight line method and declining balance method, Economic Justification of Asset Replacements.

**[T1,T2] [No. of Hrs. 12]****UNIT – III**

Types of business ownership: Private ownership- individual, Partnership, Joint stock companies, Co-operative societies, State ownership-government departmental organization, Public corporations, Government companies, Public Private Partnership (PPP) and its management. Store keeping, Elements of Materials management and control polices. Banking: Meaning and functions of commercial banks, Function of Reserve Bank of India.

**[T2,R4] [No. of Hrs. 12]****UNIT IV**

Asset Depreciation and its Impact on Economic Analyses, Depreciation Policy, Straight line method and declining balance method, Economic Justification of Asset Replacements. Development of business case analyses for new product development projects and the impact of taxes on engineering economic decisions. Inflation and its impact on economy.

**[T1, R5][No. of Hours: 11]****Text Books:**

- [T1] Sullivan, Wicks, Koelling, "Engineering Economy", Pearson Education  
 [T2] S.C. Sharma and T.R. Banga, "Industrial organization and engineering economics"

**References Books:**

- [R1] Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India.  
 [R2] C. T. Horngreen, "Cost Accounting", Pearson Education India.  
 [R3] R. R. Paul, "Money banking and International Trade", Kalyani Publuisher, New-Delhi.  
 [R4] Engineering Economics by Tahir Hussain, University Science Press, 2010  
 [R5] Engineering Economics by Dr. Rajan Mishra – University Science Press, 2009  
 [R6] H.L. Ahuja, "Principle of Economics", S. Chand  
 [R7] Khan, Siddiquee, Kumar, "Engineering Economy" Pearson Education

**IRRIGATION ENGINEERING**

**Paper Code: ETCE-403**

**Paper: Irrigation Engineering**

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 of 12.5 marks

***Objective:** 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.*

**UNIT I**

Major and medium irrigation schemes of India, Command area development, Types of Soils and their suitability for irrigation, Root Zone soil water, Irrigation requirements, Irrigation water quality, Irrigation canal system, Duty of water, Canal losses, Estimation of design discharge of a canal, canal outlets, Canal regulation, Water logging, causes, effects and remedial measures.

Alluvial channels carrying clear water and Sediment-Laden water, Evaporation and seepage losses in channels, Cross section of irrigation channels, Berms, Freeboard and service road, Silting of channels.

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

**UNIT II**

Sheet pile cut-off walls, Khosla's theory and its applications, Correction for Floor Thickness, Correction for Mutual Interference of sheet piles, Correction for the slope of the floor, Method for determination of exit gradient, Uplift force on the floor of canal structure.

Canal regulation structures, Canal Fall, Types of canal fall, Cistern element, Vertical/ Horizontal/Inclined-impact Cisterns, No-Impact Cisterns, Roughening measures for energy dissipation such as Friction Block, Ribbed pitching and Provisions such as baffle wall/ deflector/dentated cill etc at the Downstream end of cistern system

Distributory Head Regulator and Cross Regulator and their Design criteria, Control of Sediment Entry into an offtaking channel.

[T1,R2][No. of Hours: 11]

**UNIT III**

Cross Drainage Structure, their need and types, Head loss through cross drainage structures, Design of Transitions for canal waterway using Hind's Method, Upiri Method and Vittal and Chiranjeevi's method, Canal Headworks, Selection of the site, Weir or Barrage, Undersluices, Divide Wall, Fish Ladder, Canal Head Regulator, Sediment Excluders and Sediment Ejector, Settling Basin, River Training for Canal Headworks.

[T2,R2][No. of Hours: 11]

**UNIT IV**

Types of dams, Factors and General Design Criteria for 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, Stability Analysis of Gravity Dams, Galleries and outlets.

Main components of Spillway, Types of spillways, energy dissipaters, Cavitation erosion on spillway surface Classification/ behaviour of rivers, Cutoffs, Aggradation and Degradation, River Training and its objectives, River training Methods such as Levees, Spurs, Guide Banks, Design of Guide Bank and Bank Protection.

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

**Text Books:**

- [T1] G.L Asawa-Irrigation and Water Resources Engineering, New Age Internal Publishers, New Delhi.  
 [T2] 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] Satya Narayana Murty Challa-Water Resources Engineering [Principles and Practice] NewAge Intl.  
 [R5] Applied Hydrology - Ven T Chow, David R Maidment, Larry W Mays, McGraw-Hill, New Delhi  
 [R6] Bharat Singh, Fundamentals of Irrigation Engineering, Nem Chand and Brothers, roorkee

**TRANSPORTATION ENGINEERING-II****Paper Code: ETCE-405****Paper: Transportation Engineering-II**

<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 of 12.5 marks

*Objective: To learn the fundamentals, planning and design concepts of railways, airways, tunneling, docks and harbours and other minor modes of transportation.*

**UNIT I**

**Components and Geometric design of Railways :** Requirement and capacity of railway tracks, Various gauges, typical cross sections, Coning of wheels and tilting of rails, Functions and requirements of component parts of a railway track, Wear and tear and creep of rails, Requirement and types of sleepers, rail fixtures, ballast, sub-grade and embankments, Geometric design of railway track, Horizontal curves, radius, super elevation, transition curves, safe speed on curves, different types of gradients, Grade compensation.

**[T1,T2][No. of Hours: 11]****UNIT II**

**Railway operation and control :** Points and crossings and their design, Track junctions and simple track layouts, details of different types of stations and yards, signaling and interlocking, Various systems for control of train movements.

**Railway construction and maintenance:** Construction of railway track, earthwork, plate laying and packing, maintenance of track alignment, renewal of component parts and track drainage, modern methods of track maintenance, Classification and causes of accidents and their prevention.

**Delhi Metro:** Salient features of design, construction, operation and maintenance.

**[T1,T2][No. of Hours: 11]****UNIT III**

**Tunneling:** Considerations in tunneling, Tunnel alignment and grade, size and shape of a tunnel, methods of tunneling in hard rocks, Methods of tunneling in soft soils, compressed air and shield tunneling, shafts in tunnels, Safety measures, ventilation, lighting and drainage in tunnels

**Docks and Harbours :** Historical development of ports, harbours and docks, Tides, winds and waves, Causes and impact of Tsunami waves, Types of harbours, Types of docks, Break waters classification and types, Jetties, Landing stages and wharves.

**[T2][No. of Hours: 11]****UNIT IV**

**Airport planning and design:** Traffic characteristics and operations, fleet requirements, component parts of airport and site selection, Runway design, Orientation, basic runway length, geometric design, design of taxiways and aprons, terminal area planning, facilities in terminal area and their planning concepts, Environmental requirements for Airport projects, Design of Airport drainage system, Lightening of airport, Specific requirements for design of airport pavements.

**[T2][No. of Hours: 12]****Text Books:**

- [T1] Saxena and Arora, "A Text Book of Railway Engineering", Dhanpat Rai publications  
 [T2] Khanna and Arora, "Airport Planning and design", Nemchand and Bros

**References Books:**

- [R1] Horonjeff, "Planning and design of Airports", TMH  
 [R2] Mundrey, "Railway Track Engineering", TMH  
 [R3] Docks and Harbours, Levison Francis, Clarendon press,(2006)  
 [R4] John O. Bickel, Thomas R. Kuesel, Elwyn H King, "Tunnel Engineering Handbook", CBS Publication.  
 [R5] Railways, Bridges and Tunnels, Vazirani. V.N, Chandola.S.P, Khanna publications, New Delhi (1997)

**WATER RESOURCE SYSTEM PLANNING**

**Paper Code: ETCE-411**

**Paper: Water Resource System planning**

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 of 12.5 marks

***Objective:** The course will cover the topics of water planning and management by providing in- depth coverage of the tools of analysis, namely econometric principles, Fuzzy rule based model, optimization and simulation, and by providing the theoretical framework for analysis.*

**UNIT I**

Introduction of Water Systems engineering-scope and approach  
Issues and the systems planning approach, Water system dynamics, Water Resource [W.R.] development alternatives, Water systems planning objectives, Constraints and Criteria,  
Economic and Econometric principles, Cost and Benefit Curves.

**[T1,R2][No. of Hours: 10]**

**UNIT II**

Application of Linear programming [LP] and Dynamic programming [DP] models in Water Resource Engineering, Problem formulation for W.R. systems, Multi-objective Water Resource Planning, Non-inferior Solutions, Plan Formulation, Weighting Method, Constraint Method, Plan Selection.

Reservoir Operation, Standard Operating Policy, Optimal Operating Policy using LP Rules, Curves for Reservoir Operations

Reservoir Systems [Deterministic Inflow], Reservoir Sizing, Sequent Peak Analysis Neglecting Evaporation, Sequent Peak Analysis Considering Evaporation Loss, Reservoir Capacity using LP , Storage Yield Function, Mixed Integer LP Formulation for Maximizing Yield.

**[T2,R2][No. of Hours: 10]**

**UNIT III**

Multireservoir Operation, Stationary Policy using DP, Simulation of Reservoir Operation for Hydropower Generation, Reservoir Systems [Random Inflow], Lognormal and Exponential Distributions, Chance Constrained LP, Linear Decision Rule, Deterministic Equivalent of a chance constraint

Concept of Reliability, Reliability-based Reservoir Sizing, Maximum Reliability, Stochastic Dynamic programming for reservoir operation, State variable discretisation, Inflow as a stochastic process, Steady state operating policy, Steady State Probabilities, Real-time Operation, Case Study.

**[T1,T2][No. of Hours: 11]**

**UNIT IV**

Water quality managements planning and associated models, Regional planning models, Policy issues for improvement in utilization of water resources, Optical Irrigation Water allocation for single and multiple crops, Crop Yield optimization.

Applications of Linear Programming in [1] Optimal Irrigation water allocation to multiple crops, [2] Multireservoir system for irrigation planning, [3] Reservoir Operation [Short term] for irrigation, [4] Reservoir operation for Hydropower optimization.

Application of dynamic programming in - [1] Steady State Reservoir operating policy for irrigation, [2] Real-time Reservoir Operation for Irrigation, An Example application for inflow forecasting, Fuzzy Sets and Fuzzy logic, Introduction, Fuzzy rule based reservoir operation model.

**[T1,R3] [No. of Hours: 10]**

**Text Books:**

[T1] Water Resources Systems Planning and Management, Sharad K. Jain, V.P. Singh, Elsevier, 2003

[T2] Water Resources Systems Planning and Management: An Introduction to Methods, Models and Applications, Daniel P. Loucks, Eelco Van Beek, 2005.

**References:**

[R1] S.Vedula, P.P.Majumdar-Water Resources Systems, Tata Mcgraw Hill Publishing Company Ltd., ND

[R2] M.C. Chaturvedi, W.R.Systems-Planning and Management, Tata McGraw Hill Publications, New Delhi

- [R3] Louks D Petal W.R. System Planning and Analysis, Prentice Hall – 1981.  
[R4] Maass. A. eta:-Design Water Resources Systems-McMillan, 1968.  
[R5] A.S. Goodman, Principals of Water Resources Planning, Prentice Hall, 1984





**EARTHQUAKE TECHNOLOGY**

**Paper Code: ETCE-413**

**Paper: Earthquake Technology**

<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 of 12.5 marks

***Objective:** To introduce the basic concepts in dynamic as well as probabilistic modeling of earthquake loading and dynamic analyses/simulation with uncertainty in earthquake engineering and to introduce the basics of structural dynamic analyses with emphasis on earthquake engineering applications.*

**UNIT I**

Introduction, Causes and Classification of Earthquakes, Surface Wave Magnitude, Body Wave Magnitude, Moment Magnitude, Modified Mercalli Intensity Scale, Comprehensive Intensity Scale [MSKG 64] as per IS: 1893 Part-I, Characteristics of ground motion, local site effects, Impact of earthquake on buildings and infrastructure, Iso-seismal map, Development of seismic zoning map of India, Types of Ground failures due to earthquake.

D' Alembert's principle, Equation of motion, Degrees of freedom, Damping, Free and Forced Vibrations of an un-damped and damped single degree freedom system and its equivalence.

[T1][No. of Hours: 11]

**UNIT II**

Free vibrations of an Un-damped two degree freedom system, Determination of frequencies and mode shape and concept of vibration absorber, Equation of Motion for multi-degree freedom system using D' Alembert's principle, Stiffness Coefficient and Flexibility coefficient, Determination of Frequencies and Mode Shapes for Three storey building idealize as lumped mass cantilever model with one degree of freedom at each mass, using matrix iteration technique, Holzers' Method and Stodolas' Method.

[T2][No. of Hours: 11]

**UNIT III**

Orthogonality Property of Normal Modes, Modal Analysis, Modal Super position Methods, Fourier Spectra, Response Spectra, Dynamic Analysis by Response Spectrum Method as per IS 1893, Effect of form and irregularities in building as per IS 1893 on its seismic performance, Short column Effect.

Comparative Merits of Stiff and Flexible construction, Failure Modes, Whipping Effect, General Principles and Philosophy of Earthquake Resistant Design, Concept of Capacity Based Design and Performance Based Design. Torsion in buildings during earthquakes, Determination of Torsional shares in columns of a framed building. Different type of lateral load resistance systems, Pounding of buildings and Required seismic separation between two adjacent buildings storey, Drift limitations for Buildings as per IS Code, Introduction of P- Δ Effect,

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

**UNIT IV**

Earthquake resistance requirements for horizontal and vertical projections of the building, Special considerations for non-structural components attached to the building.

Importance of shear wall buildings in earthquake resistance and Design of Reinforced Concrete Shear Walls as per IS 13920, Concept of Vibration Isolation of Buildings, Control devices like active control, passive control, hybrid control, semi-active control, isolation devices, energy dissipation devices, Need for Seismic Evaluation of Buildings and their Retrofitting, Condition Assessment of existing Buildings, GSDMA Guidelines on Seismic Evaluation and strengthening of Buildings.

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

**Text Books:**

- [T1] Steven and Kramer.-Geotechnical Earthquake Engineering, Pearson Education.  
 [T2] Anil K. Chopra -Dynamics of Structures" [Third Edition], Published by Pearson Education

**References Books:**

- [R1] IS 1893 [Part-I]- 2002 : "Criteria for Earthquake Resistance Design of Structure".  
 [R2] IS 4326: 1993 – "Earthquake Resistant Design and Construction of Building – Code of Practice.

**Modified Scheme and Syllabus of B. Tech-CIVIL Engg. (1<sup>st</sup> Semester to 8<sup>th</sup> Semester) implemented from Academic Session w.e.f. 2015-16, approved in the 23<sup>rd</sup> BOS and 40<sup>th</sup> AC meeting of USET.**

- [R3] IS 13920: 1993 – Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Force – Code of Practice.
- [R4] IS 13935: 1995 “Repair and Seismic Strengthening of Buildings – Guidelines “.
- [R5] GSDMA-IITK “Guidelines for Seismic Strengthening of Buildings.



**GEO-SYNTHETICS AND REINFORCED SOIL****Paper Code: ETCE-415****Paper: Geo-synthetics and Reinforced Soil**

<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 of 12.5 marks

*Objective: To introduce the students to the different types of geosynthetics, their manufacturing technique, testing methods and their applications in different types of Civil Engineering projects.*

**UNIT - I**

**Introduction:** Historical background of reinforced soil, Principles of reinforced soil through Mohr circle analysis.

**Different types of geosynthetics:** Types of geosynthetics like geotextiles, geogrids, geonets, geocells, geo-composites, their manufacturing methods.

**Testing methods for geosynthetics:** Techniques for testing of different index properties, strength properties, Apparent Opening Size, In-plane and cross-plane permeability tests.

**[T1,T2][No. of Hrs: 12]****UNIT - II**

**Reinforced Soil retaining walls:** Different types of walls like wrap-around walls, full-height panel walls, discrete-facing panel walls, modular block walls Design methods as per BS-8006 and FHWA methods Construction methods for reinforced soil retaining walls.

**Reinforced soil slopes:** Different slope stability analysis methods like planar wedge method, bi-linear wedge method, circular slip methods, Erosion control on slopes using geosynthetics.

**[T1][No. of Hrs: 12]****UNIT - III**

**Applications in foundations:** Binquet and Lee's approach for analysis of foundations with reinforcement layers.

**Drainage and filtration applications of geosynthetics:** Different filtration requirements, filtration in different types of soils and criteria for selection of geotextiles.

**[T2][No. of Hrs: 10]****UNIT - IV**

**Pavement application:** Geosynthetics for separation and reinforcement in flexible pavements, design by Giroud-Noiray approach, reflection cracking and control using geosynthetics.

**Construction of landfills using geosynthetics:** Different components of modern landfills, collection techniques for leachate, application of different geosynthetics like geonets, geotextiles for drainage in landfills, use of geomembranes and Geosynthetic Clay Liner [GCL] as barriers.

**[T1,T2][No. of Hrs: 11]****Text Books:**

- [T1] Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 4th edition.  
 [T2] Jewell, R.A., "Soil Reinforcement with Geotextiles", Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.

**References**

- [R1] Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.  
 [R2] Reinforced Soil Engineering: Advances in Research and Practice, Hoe I. Ling, Dov Leshchinsky Fumio 2003-Tatsuoka.  
 [R3] Design and Practice of Geosynthetic-Reinforced Soil Structures, Hoe I. Ling, Guido Gottardi Daniele, 2013-Cazzuffi  
 [R4] Geosynthetics and Their Applications, Sanjay Kumar Shukla – 2002  
 [R5] Geosynthetics Asia 1997: Select papers, C.V.J. Varma, Venkatappa Rao, G 1998-Rao, G.R.A

**STRUCTURE REPAIR AND REHABILITATION**

**Paper Code: ETCE-417**

**Paper: Structure Repair and Rehabilitation**

<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 of 12.5 marks

*Objective: To help students in understanding the various causes of structural failure and latest techniques in repair and rehabilitation of structures.*

**UNIT I**

**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][No. of Hours: 12]

**UNIT II**

**Materials and methods for repair and rehabilitation:** planning and design of concrete repair, Autogeneous healing, crack arrest techniques, drilling and plugging, Fiber reinforced concrete, flexible sealing, gravity soak, chemical grouting, hydraulic-cement grouting, jacketing, polymer overlays, polymer coating, polymer injection, polymer concrete, shotcrete, judicious neglect, shrinkage-compensating concrete.

[T2][No. of Hours: 12]

**UNIT III**

**Maintenance of concrete:** Stains and stain removal, cleaning details, oil stains, grease, dirt, mildew, asphalt, efflorescence, coating and sealing compounds.

**Specialized repairs:** rehabbing lock walls, blasting lock walls, anchors, pre-placed aggregate concrete, cut-off walls, under water repairs, geomembrane work.

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

**UNIT IV**

**Trouble shooting defects in concrete:** excess water, bad design data, chemical attacks, alkali-aggregate reaction, freezing, moving water and cavitation.

[T1,T2][No. of Hours:10]

**Text Books:**

[T1] S.N.Sinha , RCC Design, Tata McGraw-Hill Publishing ltd,2002

[T2] Allen R.T.L, Repair Of Concrete Structures, John Willey and Sons,1987

**References Books:**

[R1] Handbook on repair and rehabilitation of RCC buildings, published by CPWD, Government of India. <http://cpwd.gov.in/Units/handbook.pdf>

[R2] R. Dodge Woodson [2009]. Concrete Structures: Protection, Repair and Rehabilitation. Elsevier publications.

[R3] B .Sivagnanam –“Rehabilitation“- Indian concrete journal, December 2002, vol.76.

[R4] [http://www.structural.net/Repair/repair\\_concrete.html](http://www.structural.net/Repair/repair_concrete.html)

[R5] [http://www.icivilengineer.com/Structural\\_Engineering/Structure\\_Maintenance/](http://www.icivilengineer.com/Structural_Engineering/Structure_Maintenance/)

**DATA ANALYTICS****Paper Code: ETCE-419****Paper: Data Analytics**

<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 of 12.5 marks

*Objective: This course is aimed at providing in-depth understanding of data analysis based on statistical techniques. The approach to data analysis involves exploratory methods, continuous distributions such as normal, lognormal distribution, probability plotting for normal distributions, hypothesis testing etc. The subject deals with model estimation and testing using para metric and non parametric methods, identification and accommodation of outliers, frequency analysis of extreme events like fllid, storms, droughts etc and use of simulation techniques such as monte-carlo simulation.*

**UNIT – I**

**Preliminary Data Analysis:** Graphical representation-line diagram or Bar Chart, Dot diagram, Histogram, Exploratory methods- stem and leaf plot, Box plot. Random events- sample space and events, the null event, Intersection and Union, Venn Diagram and Event space. Continuous Distributions- Normal Distribution, Lognormal Distribution, Bivariate Normal Distribution.

**[T1][No. of Hrs. 10]****UNIT – II**

**Model Estimation and Testing:** Properties of Estimators- Unbiasedness, Consistency, Minimum Variance, Efficiency, Sufficiency. Estimation of Confidence Intervals. Hypothesis testing- Procedure for testing, Probabilities of Type I and Type II Errors and the power function, Tests of Hypothesis involving the Variance, the F Distribution and its use. Nonparametric methods- Wilcoxon Signed- Rank Test for Association of Paired Observations.

**[T2][No. of Hrs. 12]****UNIT – III**

**Goodness of Fit Tests:** Chi-squared Goodness of Fit test, Kolmogorov- Smirnov Goodness of Fit test, Kolmogorov- Smirnov Two- sample test, Anderson- Darling Goodness of Fit test, Other methods for testing the Goodness of Fit to a Normal Distribution.

**Analysis of Variance:** One-Way Analysis of Variance, Two-way analysis of Variance.

Probability Plotting for Normal Distribution, Probability Plotting for Type I Extreme Value Distribution.

**Identification and Accomodation of Outliers:** Hypothesis Tests, Test Statistics for Detection of Outliers, Dealing with Nonnormal Data.

Estimation of Probabilities of Extreme events when outliers are present. Multivariate Analysis- Principle Components Analysis, Factor Analysis, Cluster analysis.

**Spatial Correlation:** The Estimation problem, Spatial Correlation and the Semivariogram, some Semivariogram Models and Physical Aspects, Spatial Interpolations and Kriging.

**[T1,T2] [No. of Hrs. 12]****UNIT – IV**

**Frequency Analysis of Extreme Events:** Order Statistics- Functions of Order Statistics, Expected value and Variance of Order Statistics, Expected Value and Variance of Order Statistics. Extreme Value Distributions- Basic Concepts, Gumbel Distribution, Weibull Distribution as an Extreme Value Model, General Extreme Value Distribution. Analysis of Natural Hazards: Floods, storms and Droughts, Earthquakes and volcanic eruptions, winds, sea levels and Highest sea waves.

**Simulation techniques for Design:** MonteCarlo Simulation- Statistical Experiments, Probability Integral Tranform, Sample size and accuracy of Monte Carlo Experiments.

**[T1,T2] [No. of Hrs. 11]****Text Books:**

[T1] Kottogoda N.T. and Rosso R., “Probability, Statistics and Reliability for Civil and Environmental Engineers”, McGraw Hill, USA.

[T2] Azzalini A., Scarpa B., “Data Analysis and Data Mining- An Introduction”, Oxford University Press, New York.

**Reference Books:**

- [R1] Stokes M.E., Davis C.S., Koch G.G., “Categorical Data Analysis Using the SAS System”, SAS Publishing, North Carolina.
- [R2] Ruppert D., “Statistics and Data Analysis for Financial Engineering”, Springer, New York.



**PLANNING AND DESIGN OF GREEN BUILDINGS**

**Paper Code: ETEN-419**

**Paper: Planning and design of Green buildings**

<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 of 12.5 marks

**Objective:**

1. To introduce the key concept, requirements and important issues of Designs Construction and Commissioning of green buildings.
2. To develop practical skills for planning and designing sustainable building projects.

**UNIT – I**

Green building concept- History, Increased public focus on Sustainability and Energy Efficiency, Supportive Framework and general condition, Green Home Certifications, CO<sub>2</sub> Emission Trade, High Performance Building Characteristic, the LEED rating system, Rating system for Sustainable Building.

An integrated view of green building- Lifecycle engineering, Barriers to green building growth.

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

**UNIT – II**

Green Building Requirements : Principles of Energy, Heat Flow, Fuel Types, Air Flow, Moisture Flow, Condensation and Dew Point, Relative Humidity, Concept of Earth air Tunnel System for moderating air temperature.

Design, construction, commissioning and monitoring for green building- Urban development and infrastructure, building shape and orientation, building envelope, building materials and furnishing, natural resources.

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

**UNIT – III**

Planning of Green From Start- Traditional Design, Integrated Design, Site Selection , Site Development, House Design, Construction and Planning, Construction Waste, Remodeling

Structural System- Types of Foundation, Foundation Selection, Materials required, Soil Gas, Tree Protection, Pest Control, Floors and Exterior walls, Roofs, Landscaping.

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

**UNIT – IV**

Sustainable building procedure requirement, Blower door test, Thermography, Indoor Comfort, Air Quality, Noise Protection, Day light Performance and Non-Glaring, Emulation, Monitoring and Energy Management, Conscious handling of resources- Energy benchmark as target values for design, regenerative energy resources, primary energy demand for indoor climate conditioning, Energy demand for Lifecycle of a building, Water requirement, Case study.

[T1,T2][No. of Hours: 10]

**Text Books:**

- [T1] Yudelson J, “The Green Building Revolution”, Island Press, New York.  
 [T2] Kibert C.J., “Sustainable Construction - Green Building Design and Delivery” John Wiley and Sons, New York

**Reference Books:**

- [R1] Edward B., “Guide to Sustainability: A Design Primer”, RIBA Publishing, U.K.  
 [R2] Sassi P., “Strategies for Sustainable Architecture”, Taylor and Francis, New York.  
 [R3] Wines J., “Green Architecture”, Taschen, New York.

**DATA COMMUNICATIONS AND NETWORKS****Paper Code: ETEC-421****L T/P C****Paper: Data Communications and Networks****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 of 12.5 marks

**Objectives:** The objective of the paper is to provide an introduction to the fundamental concepts on data communication and the design, deployment, and management of computer networks.

**UNIT- I**

**Data Communications :** Components, protocols and standards, Network and Protocol Architecture, Reference Model ISO-OSI, TCP/IP-Overview, topology, transmission mode, digital signals, digital to digital encoding, digital data transmission, DTE-DCE interface, interface standards, modems, cable modem, transmission media-guided and unguided, transmission impairment, Performance, wavelength and Shannon capacity.

**Error Detection and Correction:**

Types of error, Error detection codes:-parity, linear block codes, cyclic redundancy check (CRC codes); Burst error detecting and correcting codes; Convolution codes.

**Switching:**

Circuit switching (space-division, time division and space-time division), packet switching (virtual circuit and Datagram approach), message switching.

**[T1, T2, R3][No. of Hours: 11]****UNIT- II**

**Data Link Layer:** Design issues, Data Link Control and Protocols: Flow and Error Control, Stop-and-wait ARQ, Sliding window protocol, Go-Back-N ARQ, Selective Repeat ARQ, HDLC, Point-to-Point Access: PPP Point-to-Point Protocol, PPP Stack,

**Medium Access Sub layer:** Channel allocation problem, Controlled Access, Channelization, multiple access protocols, IEEE standard 802.3 and 802.11 for LANS and WLAN, high-speed LANs, Token ring, Token Bus, FDDI based LAN, Network Devices-repeaters, hubs, switches bridges.

**[T1, T2][No. of Hours: 11]****UNIT- III**

**Network Layer:** Design issues, Routing algorithms, Congestion control algorithms, Host to Host Delivery: Internetworking, addressing and routing, IP addressing (class full and Classless), Subnet, Network Layer Protocols: ARP, IPV4, ICMP, IPV6 and ICMPV6.

**[T1, T2][No. of Hours: 11]****UNIT- IV**

**Transport Layer:** Process to Process Delivery: UDP; TCP, congestion control and Quality of service.

**Application Layer:** Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP), file transfer (FTP), HTTP and WWW.

**[T2, T1, R3][No. of Hours: 11]****Text Books:**

- [T1] Computer Networks: A. S. Tannenbum, D. Wetherall, Prentice Hall, Pearson, 5<sup>th</sup> Ed  
 [T2] Data Communications and Networking: Behrouz A. Forouzan, Tata McGraw-Hill, 4<sup>th</sup> Ed

**Reference Books:**

- [R1] Computer Networks: A system Approach: Larry L, Peterson and Bruce S. Davie, Elsevier, 4<sup>th</sup> Ed.  
 [R2] Introduction to data Communications and Networking, Tomasi, Pearson 7<sup>th</sup> impression 2011  
 [R3] Data and Computer Communications: William Stallings, Prentice Hall, Imprint of Pearson, 9<sup>th</sup> Ed.  
 [R4] Network for Computer Scientists and Engineers: Zheng, Oxford University Press  
 [R5] Data Communications and Networking: White, Cengage Learning



**SOCIOLOGY AND ELEMENTS OF INDIAN HISTORY FOR ENGINEERS**

**Paper Code: ETHS-419**

**L T/P C**

**Paper: Sociology and Elements of Indian History for Engineers**

**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 of 12.5 marks.

*Objective: The objective of this course is to familiarize the prospective engineers with elements of Indian history and sociological concepts and theories by which they could understand contemporary issues and problems in Indian society. The course would enable them to analyze critically the social processes of globalization, modernization and social change. All of this is a part of the quest to help the students imbibe such skills that will enhance them to be better citizens and human beings at their work place or in the family or in other social institutions.*

**UNIT I**

*Module 1A: Introduction to Elements of Indian History: What is history? ; History Sources-Archaeology, Numismatics, Epigraphy and Archival research; Methods used in History; History and historiography;*  
[3 Lectures]

*Module 1B: Introduction to sociological concepts-structure, system, organization, social institution, Culture social stratification (caste, class, gender, power). State and civil society;*  
[7 Lectures]

[T1][No. of Hrs. 10]

**UNIT II**

*Module 2A: Indian history and periodization; evolution of urbanization process: first, second and third phase of urbanization; Evolution of polity; early states of empires; Understanding social structures-feudalism debate;*  
[3 Lectures]

*Module 2B: Understanding social structure and social processes: Perspectives of Marx, Weber and Durkheim;*  
[7 Lectures]

[T1][No. of Hrs. 10]

**UNIT III**

*Module 3A: From Feudalism to colonialism-the coming of British; Modernity and struggle for independence;*  
[3 Lectures]

*Module 3B: Understanding social structure and social processes: Perspectives of Marx, Weber and Durkheim;*  
[9 Lectures]

[T1][No. of Hrs. 12]

**UNIT IV**

*Module 4A: Issues and concerns in post-colonial India (upto 1991); Issues and concerns in post-colonial India 2<sup>nd</sup> phase (LPG decade post 1991)*  
[3 Lectures]

*Module 4B: Social change in contemporary India: Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing nature of work and organization.*

[10 Lectures]

[T1][No. of Hrs. 13]

**Text Books:**

[T1] Desai, A.R. (2005), Social Background of Indian Nationalism, Popular Prakashan.

[T2] Giddens, A (2009), Sociology, Polity, 6<sup>th</sup> Edition

**Reference Books:**

[R1] Guha, Ramachandra (2007), India After Gandhi, Pan Macmillan

[R2] Haralambos M, RM Heald, M Holborn (2000), Sociology, Collins.

**DATABASE MANAGEMENT SYSTEMS**

**Paper Code: ETCS-425**

**Paper: Database Management Systems**

<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 of 12.5 marks.

*Objective: The concepts related to database, database techniques, SQL and database operations are introduced in this subject. This creates strong foundation for application data design.*

**UNIT-I : Introductory Concepts of DBMS:** Introduction and application of DBMS, Data Independence, Database System Architecture – levels, Mapping, Database users and DBA, Entity – Relationship model, constraints, keys, Design issues, E-R Diagram, Extended E-R features- Generalization, Specialization, Aggregation, Translating E-R model into Relational model.

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

**UNIT-II : Relational Model:** The relational Model, The catalog, Types, Keys, Relational Algebra, Fundamental operations, Additional Operations-, SQL fundamentals, DDL,DML,DCL PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Integrity – Triggers.

**[T2, R3][No. of Hrs. 10]**

**UNIT-III:** Functional Dependencies, Non-loss Decomposition, First, Second, Third Normal Forms, Dependency Preservation, Boyce/Codd Normal Form, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

**[T2, R1][No. of Hrs. 10]**

**UNIT-IV: Transaction Management:** ACID properties, serializability of Transaction, Testing for Serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, Database recovery management.

**Implementation Techniques:** Overview of Physical Storage Media, File Organization, Indexing and Hashing, B+ tree Index Files, Query Processing Overview, Catalog Information for Cost Estimation, Selection Operation, Sorting, Join Operation, Materialized views, Database Tuning.

**[T1, T2, R2][No. of Hrs. 12]**

**Text Books:**

- [T1] Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, 5<sup>th</sup> Edition, Tata McGraw Hill, 2006
- [T2] Elmsari and Navathe, “Fundamentals of Database Systems”, 4th Ed., A. Wesley, 2004

**References Books:**

- [R1] C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, 8<sup>th</sup> Edition, Pearson Education, 2006.
- [R2] J. D. Ullman, “Principles of Database Systems”, 2nd Ed., Galgotia Publications, 1999.

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**IRRIGATION ENGINEERING DESIGN LAB****Paper Code: ETCE-451****L****T/P****C****Paper: Irrigation Engineering Design Lab****0****2****1****List of Experiments:**

List of design, detailing and drawing of the following problems:

1. Design of Irrigation Canal [lined and unlined]
2. Design of canal outlets
3. Design of Alluvial channels carrying clear and sediment laden water
4. Design the section of hydraulic jump
5. Design of cross drainage structures with typical plan and section
6. Design of profile of ogee spillway
7. Design of Trapezoidal Notch Fall, SARDA fall and Glacis Fall.
8. Design of Cisterns
9. Analysis and Design of gravity dam
10. Analysis and Design of earth embankment dam
11. Problems related to energy dissipaters

**NOTE:- At least 8 Experiments out of the list must be done in the semester.**


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**ECONOMICS OF INFRASTRUCTURE PROJECTS: CASE STUDIES**

Paper Code: ETCE-453	L	T/P	C
Paper: Economics of Infrastructure Projects: Case Studies	0	2	1

Based on theory course ETCE-401, 10-12 exercises, designs/experiments.

NOTE:- At least 8 Experiments from the syllabus must be done in the semester.



**DATABASE MANAGEMENT SYSTEMS LAB**

<b>Paper Code: ETCE-459(ELECTIVE)</b>	<b>L</b>	<b>T/P</b>	<b>C</b>
<b>Paper: Database Management Systems Lab</b>	<b>0</b>	<b>2</b>	<b>1</b>

**LAB BASED ON DBMS**

Lab includes implementation of DDL, DCL, DML i.e SQL in Oracle.

**List of Experiments:**

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER, UPDATE and DELETE
4. Write the queries to implement the joins
5. Write the queries for implementing the following functions: MAX (), MIN (),AVG (),COUNT ()
6. Write the queries to implement the concept of Integrity constrains
7. Write the queries to create the views
8. Perform the queries for triggers
9. Perform the following operation for demonstrating the insertion, updation and deletion using the referential integrity constrains

**TEXT BOOK:**

1. SQL/ PL/SQL, The programming language of Oracle, Ivan Bayross, 4th Edition BPB Publications



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**MINOR PROJECT****Paper code: ETCE-455****Paper: Minor Project**

L	T/P	C
0	6	3

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format.

The Project work will be a design project or experimental project or computer oriented project or Research Review Project on any of the topics of civil engineering interest. It will be a group project.

The assessment of the project will be done at the end of the 7th semester by a departmental committee consisting of 2-3 faculty members/experts specialized in various fields of Civil Engineering. The students will present their project work before the committee. The complete project report is to be submitted prior to the practical exams of 7th semester. However, an interim report based on the work carried out will have to be submitted by the students within two weeks of first mid semester exam of 7th semester to the Project Guides based on the Assessment after submission of interim report, but prior to commencement of Theory exams.



**INDUSTRIAL TRAINING RELATED TO CIVIL ENGINEERING****Paper code: ETCE-457****L****T/P****C****Paper: Industrial Training related to Civil Engineering****0****0****1**

Minimum 4 weeks Industrial Training related to Environmental Engineering is to be conducted after 6<sup>th</sup> semester. However, weekly presentations and Viva-voce is to be conducted in this semester.



**HUMAN VALUES AND PROFESSIONAL ETHICS – II****Paper Code: ETHS-402****L T/P C****Paper : Human Values and Professional Ethics-II****1 0 1****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.
3. Two internal sessional test of 10 marks each and one project report\* carrying 5 marks.

**Objectives:**

1. The main object of this paper is to inculcate the skills of ethical decision making and then to apply these skills to the real and current challenges of the engineering profession.
2. To enable student to understand the need and importance of value-education and education for Human Rights.
3. To acquaint students to the National and International values for Global development

**UNIT I - Appraisal of Human Values and Professional Ethics:**

**Review of Universal Human Values:** Truth, Love, Peace, Right conduct, Non violence, Justice and Responsibility. Living in harmony with 'SELF', Family, Society and Nature. Indian pluralism - the way of life of Islam, Buddhism, Christianity, Jainism, Sikhism and Hinduism, Greek - Roman and Chinese cultural values. Sensitization of Impact of Modern Education and Media on Values:

- a) Impact of Science and Technology
- b) Effects of Printed Media and Television on Values
- c) Effects of computer aided media on Values (Internet, e-mail, Chat etc.)
- d) Role of teacher in the preservation of tradition and culture.
- e) Role of family, tradition and community prayers in value development.

**Review of Professional Ethics:** Accountability, Collegiality, Royalty, Responsibility and Ethics Living. Engineer as a role model for civil society, Living in harmony with 'NATURE', Four orders of living, their inter-correctness, Holistic technology (eco-friendly and sustainable technology).

**[T1] [T2] [R1] [R5] [R4][No. of Hrs. 03]****UNIT II – Engineers responsibility for safety:**

Safety and Risks, Risk and Cost, Risk benefit analysis, testing methods for safety. Engineer's Responsibility for Safety Social and Value dimensions of Technology - Technology Pessimism – The Perils of Technological Optimism – The

Promise of Technology – Computer Technology Privacy

**Some Case Studies:** Case Studies, BHOPAL Gas Tragedy, Nuclear Power Plant Disasters, Space Shuttle Challenger, Three Mile Island Accident, etc.

**[T1] [T2] [R4] [R2][No. of Hrs. 03]****UNIT III – Global Issues:**

**Globalization and MNCs:** International Trade, Issues,

**Case Studies:** Kellogg's, Satyam, Infosys Foundation, TATA Group of Companies

**Business Ethics:** Corporate Governance, Finance and Accounting, IPR.

**Corporate Social Responsibility (CSR):** Definition, Concept, ISO, CSR.

**Environmental Ethics:** Sustainable Development, Eco-System, Ozone depletion, Pollution.

**Computer Ethics:** Cyber Crimes, Data Stealing, Hacking, Embezzlement.

**[T1] [T2] [R4][No. of Hrs. 05]****UNIT IV - Engineers Responsibilities and Rights and Ethical Codes:**

Collegiality and loyalty, Conflict of interests, confidentiality, occupational crimes, professional rights, responsibilities. To boost industrial production with excellent quality and efficiency, To enhance national economy, To boost team spirit, Work Culture and feeling of job satisfaction, National integration, Examples of some illustrious professionals.

Need for Ethical Codes, Study of some sample codes such as institution of Electrical and Electronics Engineers, Computer Society of India etc., Ethical Audit.

**Development and implementation of Codes:** Oath to be taken by Engineering graduates and its importance\*\*,

**[T1] [T2] [R4][R2][No. of Hrs. 05]**



**Text Books:**

- [T1] Professional Ethics, R. Subramanian, Oxford University Press.  
 [T2] Professional Ethics and Human Values: Prof. D.R. Kiran, TATA Mc Graw Hill Education.

**References Books:**

- [R1] Human Values and Professional Ethics: R. R. Gaur, R. Sangal and G. P. Bagaria, Eecel Books (2010, New Delhi). Also, the Teachers' Manual by the same author  
 [R2] Fundamentals of Ethics, Edmond G. Seebauer and Robert L. Barry, Oxford University Press  
 [R3] Values Education: The paradigm shift, by Sri Satya Sai International Center for Human Values, New Delhi.  
 [R4] Professional Ethics and Human Values – M.Govindrajana, S.Natarajan and V.S. Senthil Kumar, PHI Learning Pvt. Ltd. Delhi  
 [R5] A Textbook on Professional Ethics and Human Values – R.S. Naagarazan – New Age International (P) Limited, Publishers New Delhi.  
 [R6] Human Values and Professional Ethics- S B Gogate- Vikas Publishing house PVT LTD New Delhi.  
 [R7] Mike Martin and Roland Schinzinger, "Ethics in Engineering" McGraw Hill  
 [R8] Charles E Harris, Micheal J Rabins, "Engineering Ethics, Cengage Learning  
 [R9] PSR Murthy, "Indian Culture Values and Professional Ethics", BS Publications  
 [R10] Caroline Whitback< Ethics in Engineering Practice and Research, Cambridgs University Press  
 [R11] Charles D Fleddermann, "Engineering Ethics", Prentice Hall.  
 [R12] George Reynolds, "Ethics in Information Technology", Cengage Learning  
 [R13] C, Sheshadri; The Source book of Value Education, NCERT  
 [R14] M. Shery; Bhartiya Sanskriti, Agra (Dayalbagh)

\*Any topic related to the experience of the B.Tech student in the assimilation and implementation of human values and professional ethics during the past three years of his/her studies in the institute OR A rigorous ethical analysis of a recent case of violation of professional ethics particularly related to engineering profession.

\*\*All students are required to take OATH in writing prior to submission of major project and the record of the same is to be maintained at the college level and/or, this oath may be administered by the head of the institutions during the graduation ceremonies. The draft for the same is available alongwith the scheme and syllabus.



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**OATH TO BE TAKEN BY ENGINEERING GRADUATES**

In a manner similar to the Hippocratic Oath taken by the medical graduates, Oath to be taken by the engineering graduates is as given below.

1. I solemnly pledge myself to consecrate my life to the service of humanity.
2. I will give my teacher the respect and gratitude, which is their due.
3. I will be loyal to the profession of engineering and be just and generous to its members.
4. Whatever project I undertake, it will be for the good of mankind.
5. I will exercise my profession solely for the benefit of humanity and perform no act for criminal purpose and not contrary to the laws of humanity.
6. I will keep away from wrong, corruption and avoid tempting others to vicious practices.
7. I will endeavor to avoid waste and consumption of non-renewable resources.
8. I will speak out against evil and unjust practices whenever and wherever I encounter them.
9. I will not permit considerations of religion, nationality, race, party politics or social standing to intervene between my duty and my work, even under threat.
10. I will practice my profession with conscience, dignity and uprightness.
11. I will respect the secrets, which are confided to me.

I make these promises solemnly, freely and upon my honor.

(Name of the Student)

**Correspondence Address:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Email:** \_\_\_\_\_

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**PLANNING AND MANAGEMENT OF CONSTRUCTION PROJECTS**

<b>Paper Code: ETCE-404</b>	<b>L</b>	<b>T/P</b>	<b>C</b>
<b>Paper: Planning and Management of Construction Projects</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 of 12.5 marks.

***Objective:** 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, O and M works, contract Management etc.*

**UNIT-I**

**Master Plan and Building By laws:** Objectives and necessity of Master Plan, Land use features, Building Bylaws, Function of Local Authority. Provision of Building Regulation, Salient features of Land Acquisition, etc

**Project Planning:** Scheduling, Controlling, Methods of Planning and Programming, Schedules for Labour, Materials and Equipment, Graphical Presentation of Earthwork.

**Work Accounts:** Muster roll, measurement book, cash book imprest, temporary advance, classification of stores, stock, receipt and issue of stores, authority of use, and materials at site account, Master Test Register-Site Order Book, Dismantle Register, Inspection Register, Hindrance Register, Building Register surplus and shortage, A Sample Case Study.

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

**UNIT-II**

**Network and Network Analysis:** CPM, Activity time estimate, earliest event time, Latest allowable occurrence time, Start and finish time of activity, Float, Critical activities and critical path, updating crashing.

Development of PERT network, Network rules, Graphical guidelines for networks, Work breakdown structure, Time estimates and computations using PERT.

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

**UNIT-III**

**Contract Management:** Scope of work, Detailed Estimate [approved plan], Administrative approval/Estimate Sanction, Notice inviting tenders and its types, Tender, earnest money deposit, security deposit, types of contracts, Essentials of legally valid contract, Contract between Engineer and Employers, Appointment and authority of Engineer for execution of civil construction works, Category of contractors.

**Public Works Administration:** C.P.W.D. Organization set up, system of accounts, classes of works in PWD, Estimates, Delhi Scheduled Rules [CPWD], Cost adjustment indices sub head, sub works, administrative approval, technical sanction, possession of funds, expenditure sanction, Various methods of executing works.

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

**UNIT-IV**

Project Monitoring using PRIMAVERA or MS Project

**Construction Equipment:** Equipment for excavation and transportation of earth, hauling equipment, hoisting equipment, pile driving equipment, Equipment for pumping water, Dozers and cranes, Scraper, Batching plants, RMC equipment etc.

[T1,T2][No. of Hours: 10]

**Text Books:**

- [T1] Managing Construction Projects by Graham M. Winch, John Wiley and Sons, 2010  
 [T2] Construction project management: planning and scheduling by Henry F. W. Naylor -Delmar Pub, 1995

**References Books:**

- [R1] Peurifoy-Construction Planning, equipment and methods, Tata Mc Graw Hill  
 [R2] Joseph Frein- Handbook of Construction Management and Organization, Springer  
 [R3] CPWD Manual of Works.  
 [R4] G. K. Hirashan -Fundamentals of Town Planning , Dhanpat Rai Publication  
 [R5] Essentials of Construction Project Management by Martin Loosemore UNSW press – 2003

- [R6] Punmia and Khandelwal, "PERT and CPM", Laxmi Publications, New Delhi.  
[R7] Hinze J., "Construction Contracts", Tata McGraw Hill Education (P) Ltd., New Delhi. (for Unit-IV)  
[R8] CPWD, "Delhi Schedule of Rates", New Delhi.



**ANALYSIS AND DESIGN OF BRIDGES**

**Paper code: ETCE-406**

**Paper: Analysis and Design of Bridges**

<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 of 12.5 marks.

***Objective:** To help students in understanding the various concepts of structural analysis and design of concrete and steel bridges.*

**UNIT-I**

Selection of bridge site, preliminary data to be collected, preliminary drawings, design discharge, linear water way, economical span, location of piers and abutments, vertical clearance, width of carriageway.

Standard Specifications of Bridges, IRC Bridge codes, clearances, Dead load, live loads, application of LL on deck slabs, impact effect of wind load, longitudinal forces, centrifugal forces, Force due to water currents, buoyancy effect, temperature effects, secondary stresses, erection seismic force, specifications for railway bridges, forces due to earthquake on railway bridges.

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

**UNIT-II**

Reinforced concrete bridges, box culvers, T-beam bridges, hollow girder bridges, continuous bridges, balanced cantilever bridges, arch bridges, [Illustrative examples of culverts, T-beam bridges, balanced cantilever bridge and arch bridges.

[T1,T2][No. of Hours: 10]

**UNIT-III**

Steel bridges, plate girder bridges, box girder bridges, cable stayed bridges, suspension bridges [Illustrative examples of plate girder, truss bridge and suspension bridges].

Importance of bearings, and joints, bearings for slab bridges, bearing for girder bridges, expansion bearings, modern trend in bearing designs, joints, expansion joints.

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

**UNIT-IV**

Design of prestressed concrete slab deck, post tensioned prestressed concrete, T-Beam and Slab, Bridge deck-structural components, Load distribution methods and design, Assembly of prestressing steel and grouting of ducts, Expansion joints for bridge decks.

Design of two span continuous prestressed concrete bridge deck, Cellular Box girder bridges.

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

**Text Books:**

- [T1] Narendra Taly, Design of Modern Highway Bridges, McGraw Hill Companies.  
 [T2] O'Connor C., Design of Bridge Super Structure

**References Books:**

- [R1] D. Johnson Victor, Essentials of Bridge Engineering, Indian Book House Pvt. Ltd.  
 [R2] Edward Arnold, The theory of Suspension Bridges, Selperg A, London  
 [R3] Troystsky M.S., Cable Stayed Bridges, Crosby Lockwood Staples, London.  
 [R4] Libby and Perkins, Modern Pre stressed Concrete Highway Superstructure, CBS.  
 [R5] T. R. Jagadeesh, M.S.Jayaram, Design of Bridge Structures, Prentice Hall of India, New Delhi

**TRANSPORTATION, PLANNING AND MANAGEMENT**

**Paper Code: ETCE-410**

**Paper: Transportation, Planning and Management**

<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 of 12.5 marks.

***Objectives:** This course aims at understanding system approach to traffic planning process based on travel demand and traffic management. Further, exposure to traffic management for accident prevention, smooth highway traffic flow has been dealt. Application of queuing approach to traffic flow, trip generation, trip distribution models have also been used for traffic analysis. The ultimate aim of the course is to develop urgent intelligent transport system based on the experience of ITS in developed world.*

**UNIT-I**

Urban travel characteristics, System approach to Traffic Planning Process, Methods of Measuring Spot Speeds, Radar Speed Meters, Video Camera Method, Moving Observer Method, Presentation of Travel Time and Journey Speed Data, Vehicle Volume Classification and Occupancy Counts by manual methods, combination of manual and mechanical method, Origin-Destination Survey, Parking Surveys, Use of photographic Techniques in Traffic Survey, Analysis and Interpretation of Traffic Study, fitting a Normal Distribution Curve to Observed Speed Data, Accuracy of sampling, Time Mean Speed and Space Mean Speed.

Traffic Forecasting using travel demand function, Traffic and Parking Problems, Parking Space requirement standards, Design standards for on-street and off-street parking facilities. Public transport systems, planning for pedestrians and bicycles.

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

**UNIT-II**

Number and Location of Traffic Signals, Fixed Time Signals and Vehicle Actuated signals, Optimum Cycle Length, Co-ordinated Control of Signals, Delay at Signalized Intersections

Regulation of Vehicle Speed, Regulation concerning the Driver, Traffic Parking Regulations, Enforcement of Regulation,

Introduction to Travel Demand and Traffic Management, Traffic Management measures and their influence on accident prevention, Road Safety Audit. Theory of Traffic Flow, Basic Diagram of Traffic flow, Speed Flow Curves, Vehicular Stream equations and diagrams, Cases of uniform flow, Highway traffic flow, Shock Waves in traffic. Uninterrupted speed flow relationships, Fleet size, Transit Network fleet size, Minimum station headway or interrupted flow, Freeway capacity and level of service, Freeway congestion quantification.

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

**UNIT-III**

Application of Queuing approach to traffic flow, Probabilistic aspects of Traffic flow, Poisson's Distribution of Vehicle Arrivals, Gap and Headway Distribution, Analysis of Traffic delay at uncontrolled intersections using Adam's formula, Trip generation models: Zonal models, Category analysis. Trip distribution models: Growth factor models, Gravity models. Mode split analysis: Mode choice behavior, Mode split curves, Probabilistic models.

[T1,T2][No. of Hours: 10]

**UNIT-IV**

Urban Intelligent Transport System, Urban Transportation issues. Transportation Demand Analysis, Sequential Demand Analysis, Development of comprehensive mobility plan, Standards of Intelligent Transportation System [ITS], Experience of ITS in Europe/Japan/North America, Sensors in ITS, ITS applications such as Detector, Traffic Signal systems, Freeway Management, Electronic Road Pricing and Automatic vehicle classification, ITS for traffic law enforcement, Application of GIS in ITS. Simultaneous or direct demand formulation, Model of demand elasticities, Direct and Cross elasticities Comprehensive examples of traffic impact study.

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

**Text Books:**

[T1] Dr. L.R.Kadiyali -Traffic Engineering and Transport Planning, Khanna Publication

[T2] C.S.Papacostas and P.O.Prevedouros - Transportation Engineering and Planning, PHI, New Delhi

**References Books:**

- [R1] Urban Transport: Planning and Management by Ashok Kumar Jain – 2009, APH pub Corporation, ND.  
[R2] Partha Chakroborty Animesh Das-Principles of Transportation Engineering, PHI, New Delhi.  
[R3] Dicky J.W., Metropolitan Transportation Planning, Tata McGraw Hill  
[R4] Hutchinson B.G., Principles of Urban Transportation System Planning, McGraw Hill  
[R5] Public Transport: Its Planning, Management and Operation by Peter R. White – 2003, Spon press.



**GROUND WATER ASSESSMENT, DEVELOPMENT AND MANAGEMENT**

**Paper Code: ETCE-412**

**L T/P C**

**Paper: Ground Water Assessment, Development and Management**

**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 of 12.5 marks.

*Objective: The course will help students:*

1. To apply appropriate methods to groundwater resource evaluation;
2. Use different methods to estimate groundwater recharge;
3. Combine these skills for groundwater resource assessment, Development and Management

**UNIT-I**

Types of Water-Bearing Formations, Influence of Physiography and Climate on Ground Water availability, Ground Water Investigations, Surface Investigations, Hydrological Investigations, Test Drilling, Geophysical Methods, Resistivity Method, Electric Logging, Gamma-Ray Logging, electrical Resistivity Surveying, Seismic Refraction Surveying, Ground Water Resource Assessment, methods of Artificial Recharge of Ground Water, Ground Water Pollution, Ground Water Quality, Conjunctive Use of Ground Water with Canal Water. Aquifer Characteristics Influencing Yield of Wells, Static Water Level, Transmissibility, Coefficient of Storage, Specific Yield, Hydraulic Resistance, Leakage Factor, Steady State Radial Flow, Theoretical Aspects of Steady State Flow to Cavity Wells.

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

**UNIT-II**

Unsteady State Flow to Wells in Unconfined and Confined Aquifers, Procedure for Determining Hydraulic Properties of Confined Aquifers, Cooper-Jacob Method of Solution, Recovery Test, Unsteady State Flow to Cavity Wells, Procedure for Determining Hydraulic Properties of confined Aquifers using Cavity Wells. Pumping Tests, Step Drawdown Test, Significance of Well Loss Coefficient, Pumping Test Procedures, Observation Wells, Well Interference, Interference of Wells in Confined Aquifers. Design of Open Wells, Depth of Well, Thickness of Well Lining, Nomograph for Design of Well Steining, Design of RCC Lining, Weep Holes in Well Lining, Well Curbs, Design of Well Curb, Increasing the Yield of Open Wells, Horizontal Boring in Open Wells, Installation of Radial Filters in Wells in Alluvial Formations, Radial Boring in Open Wells. Pollution Travel in Soil and Aquifers, Location and Design of Wells with Sanitary Protection, Well Location, Well Construction, Disinfection of Wells.

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

**UNIT-III**

Multiple-Well System, Radial Wells and Infiltration Galleries, Design of Tube Wells, Design of Housing Pipe and Well Casing, Bore Size and Well Depth, Selection of Strata to be Screened, Design of Well Screen, Design of Gravel Pack, Sanitary Protection of Tube Wells, Common Causes of Contamination and Their Remedies, Design of Skimming Wells. Ground Water Exploration, Geologic and hydrologic methods, Surface geophysical methods, Hydro-geologic well logging, Geophysical well logging, Tracer techniques.

[T1,T2][No. of Hours: 10]

**UNIT-IV**

Ground Water Modelling using finite difference, use of appropriate software like Modflow etc, Case Study. Pumping of Water, Design of Centrifugal pumps, Design of Impeller, Shaft Impeller inlet and vane angles, Diameter of the Eye of Impeller, Impeller outlet and vane angle, Design of Impeller vanes, Design of Volute, Design of vanes, effect of Suction lift on discharge and efficiency, Centrifugal pump installation in open wells/tube wells, operation and maintenance. Vertical Turbine pumps and their installation, operation and maintenance, submersible pump and their installation, operation and maintenance, propeller pumps and their operating characteristics and installation, Jet pumps, Performance characteristics and installation.

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



**Text Books:**

- [T1] Karanth K.R., “Ground Water Assessment Development and Management”, Tata McGraw Hill Education (P) Ltd., New Delhi.
- [T2] Sondhi M.K., “Water Wells and Pumps”, Tata McGraw Hill Education (P) Ltd., New Delhi.

**Reference Books:**

- [R1] Garg S.K., “Environmental Engineering (Vol. 1), Water Supply Engineering”, Khanna Publishers.,New Delhi.
- [R2] Ramanathan A.L., Bhattacharya P., Keshari A.K., Bundschuh J., Chandrasekharam D., Singh S.K., “Assessment of Groundwater Resources and Management”, I.K. International (P) Ltd., New Delhi.
- [R3] Hiscock K.M., Rivett M.O., Davison R.M., “Sustainable Groundwater Development”, Geological Society Special Publication No. 193, London.



**ADVANCE GEOTECHNICAL ENGINEERING****Paper Code: ETCE-416****L T/P C****Paper: Advance Geotechnical Engineering****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 of 12.5 marks.

**Objective:** To introduce the fundamentals of soil dynamics and design of machine foundations as well as introduce the advanced topics of geotechnical engineering, such as, foundation of expansive soils and concepts and applications of geoenvironmental engineering.

**UNIT-I**

**Soil Dynamics:** One Dimensional wave propagation, One Dimensional Wave in layered body, impedance ratio, angle of refraction, critical angle of incidence, introduction of attenuation of stress waves, Definitions of Material Damping and Radiation Damping in soil.

Measurements of Wave Propagation Velocity, Shear Modulus, Thickness of soil layers etc; Field Tests like Low Strain Test, Seismic Reflection Test, Seismic Refraction Test for Horizontal Layering and inclined or irregular layering, Suspension Logging Test, Steady States Vibration [Rayleigh wave] Test, Seismic Cross Hole Test, Seismic Down Hole Test, Seismic Cone Test, Details and interpretation of Standard Penetration Test and Cone Penetration Tests. Laboratory Tests: Cyclic Triaxial Shear Test, Introduction of Centrifuge and Shaking Table Test.

**[T1,T2] [No. of Hours: 12]****UNIT-II**

**Machine Foundation:** Types of Machine Foundations, General Requirements, Design Data, Dynamic Loads induced in simple Crank Mechanism, Permissible Amplitudes and Bearing Pressure, General Theory of Transmissibility of force for Vibrating machines in brief

**Analysis and Design of Block Type Machine Foundations:** Brief review of Empirical Methods based on considering Soil as a Semi infinite Elastic Solid and Soil as a spring, Barkans Method of Analysis for Block Foundations including Vertical sliding, rocking and yawing of vibrations. Introduction of codes related with Machine Foundations.

**[T1,T2][No. of Hours: 12]****UNIT-III**

**Foundation on Expansive Soils:** Identification of expansive soils by field inspection and Laboratory Tests, general mechanism and characterization of swelling, Types of Damages in Building on expansive clay. Design of foundation on expansive soils like under-reamed piles, Computation of collapse settlement, Retaining walls in expansive soils, Treatment of cracked buildings.

**[T1,T2][No. of Hours: 10]****UNIT-IV**

**Environmental Geo-technology:** Contamination due to landfills, subsurface contamination due to leachate and its effects. One dimensional analysis of contaminant transport, contaminated sites, Containment of solid waste in landfills, Vertical barrier for containment, Geo-technical reuse of construction and industrial waste materials Case study of Ash disposal from Thermal power plant, Ash pond and its design with/without geo-textiles, Environmental impact and control.

**[T1,T2][No. of Hours: 10]****Text Books:**

- [T1] Fundamentals of Soil Dynamics by B.M. Das, Elsevier Publication  
 [T2] Foundation engineering, Varghese, PHI Learning Pvt. Ltd.

**References Books:**

- [R1] Foundation for Machine: Analysis and Design by S. Prakash and V. K. Puri, John Wiley  
 [R2] Geotechnical Earthquake Engineering by Kramer, Pearson publications.  
 [R3] Gulati-Datta - Geo-Technical Engineering, Tata McGraw Hill Publishers  
 [R4] Waste containment systems, waste stabilization and landfills: design and evaluation, Hari D Sharma, and Sangeeta P.Lewis, John Willey and Sons.  
 [R5] V.N.S. Murthy -Advanced Foundation Engineering, CBS Publishers and Distributors.  
 [R6] Foundation analysis and Design, Bowles, McGraw Hill Education(I) Pvt. Ltd.

**FEM IN STRUCTURAL ENGINEERING****Paper Code: ETCE-418****Paper: FEM in Structural Engineering**

<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 of 12.5 marks.

**Objective:** To introduce the concept of the FEM for obtaining solution of ordinary and partial differential equation. The course deals with numerical discretisation as a finite element approach and deals with various methods/problems such as Continuum problems, weighted residual methods, higher order finite element approximation, variational methods, partial discretisation and time-dependent problems and generalized finite elements and error estimates.

**UNIT-I**

**Boundary Value Problems and the Need for Numerical Discretisation:** Introduction, examples of Continuum problems, history of finite element method.

**Weighted residual methods:** Approximation by trial functions, weighted residual forms, piecewise trial functions, weak formulation, Galerkin method, examples of One-, two- and three -dimensional problems.

**[T1,T2][No. of Hours: 11]****UNIT-II**

**Higher order finite element approximation:** Degree of polynomial in trial functions and rate of convergence, the patch test, shape functions for C0 and C1 continuity, one-, two- and three-dimensional shape functions.

**Isoperimetric formulation:** The concept of mapping, isoperimetric formulation, numerical integration, mapping and its use in mesh generation.

**[T1,T2][No. of Hours: 10]****UNIT-III**

**Variational Methods:** Variational principles, establishment of natural Variational principles, approximate solution of differential equations by Rayleigh-Ritz method, the use of Lagrange multipliers, general Variational principles, penalty functions, least-square method.

**Partial discretisation and time-dependent problems:** Partial discretisation applied to boundary value problems, time-dependent problems via partial discretisation, analytical solution procedures, finite element solution procedures in time domain.

**[T1,T2][No. of Hours: 12]****UNIT-IV**

**Generalized finite elements and error estimates:** The generalized finite element method, the discretisation error in a numerical solution, measure of discretisation error, estimate of discretisation error

**Coordinate Transformation:** Transformation of vectors and tensors, transformation of stiffness matrices, degree of freedom within elements, condensation, condensation and recovery algorithm, sub structuring, structural symmetry.

**[T1,T2][No. of Hours: 12]****Text Books:**

- [T1] Zienkiewicz, O.C., and Morgan, K., Finite Element Approximation, John Wiley and Sons.  
 [T2] Reddy, J.N., An Introduction to the Finite Element Method, McGraw Hill.

**References:**

- [R1] Huebner, K.H., Thornton, E.A., and Byrom, T.G., The Finite Element Method for Engineers, John Wiley  
 [R2] Hutton, D.V., Fundamentals of Finite Element Analysis, McGraw Hill.  
 [R3] Kikuchi, N., Finite Element Methods in Mechanics, Cambridge University Press.  
 [R4] Cook, R.D., Malkus, D.S., Plesha, M.E., and Witt, R.J., Concepts and Applications of Finite Element Analysis, John Wiley and Sons.  
 [R5] Zienkiewicz, O.C., and Taylor, R.L., The Finite Element Method, Vol. I and II, McGraw Hill.

**GROUND WATER CONTAMINATION AND MITIGATION MEASURES**

**Paper Code: ETEN-418**

**L T/P C**

**Paper: Ground Water Contamination and Mitigation Measures**

**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 of 12.5 marks.

**Objective:** *The students will be able to:*

1. Describe the human activities that may modify groundwater chemistry;
2. Discuss pollutant classification and the nature of diffuse and point-source pollution, giving examples;
3. Describe the origin and properties of the major organic and inorganic pollutants;
4. Apply the principles of modelling solute transport;
5. Outline the various approaches to remediation of polluted groundwater.

**UNIT-I**

**Ground Water Movement and Contamination:** Introduction, Characteristics of Ground Water, Sources and Types of Ground Water Contamination, Principles of Ground Water Movement, General Flow Equations, Unsaturated Flow and Water Table, Ground Water Flow and Well Mechanics, Sustainable Yield, Mass Balance Equations, Specific Storage, Initial and Boundary Conditions, Boundary Surface, Particular Boundary Conditions, Complete 3-D Mathematical Flow Model, Modeling 2-D Flow in Aquifers, Complete Aquifer Flow Models, Groundwater Maps and Streamlines, Modeling Flow in the Unsaturated Zone.

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

**UNIT-II**

**Contaminant transport mechanism:** Underground storage tanks, Landfills, Septic Systems, Agricultural Wastes, Return Flow from Irrigation and Sewage, Strategy for Hydrologic Site Investigations, Geologic Data Acquisition, Hydrologic Data Acquisition, Acquisition of Soil and Groundwater Quality Data, Data Evaluation Procedures, Contaminant Transport Mechanism such as Advection, Diffusion and Dispersion, Sorption and Desorption, Biodegradation, Mass Transport Equations, One Dimensional Models, Governing Flow and Transport equations, Analytical Methods, Multi-Dimensional Methods.

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

**UNIT-III**

**Numerical Modeling of Contaminant Transport:** Introduction to Modeling Inorganic and Organic Solute Transport, Numerical Methods, Finite Difference Methods, Numeric Flow Methods, Contaminant Transport Models, Applying Numerical Models to Field Sites, Fate and Transport of organic Substances in Groundwater, Case Studies of Organic and inorganic Groundwater Pollution.

**Non-aqueous Phase Liquids (NAPLs):** Types of NAPL, Transport, Computational methods, Characterizing NAPLs at Remediation Sites.

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

**UNIT-IV**

**Natural Attenuation and Risk Based Corrective Action:** General Principles behind Natural Attenuation, Natural Attenuation Protocols and Guidance, Risk Based Corrective Action.

**Ground Water Remediation Alternatives:** Introduction to Remediation methods, Remedial Alternatives, Contaminant Methods for Source Control, Hydraulic Controls and Pump and Treat Systems. Bioremediation, Remediating NAPL Sites. Emerging Remediation Technologies, Case Studies of Remediation.

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

**Text Books:**

- [T1] Bedient P.B., Rifai H.S., Newell C.J., "Groundwater Contamination- Transport and Remediation", Prentice Hall, New York.
- [T2] Bear J. and Cheng A.H.D., "Modeling Groundwater Flow and Contaminant Transport (Theory and Applications of Transport in Porous Media)", Springer, New York.

**Reference Books:**

- [R1] Cheremisinoff N.P., "Groundwater Remediation and Treatment Technologies", Noyes Publications, New Jersey.
- [R2] Charbeneau R.J., Bedient P.B., Loehr R.C., "Groundwater Remediation", Technomic Publishing Company, Pennsylvania.

- [R3] American Society of Civil Engineers, "Groundwater Contamination by Organic Pollutants- Analysis and Remediation", Library of Congress Catalogue Card No.: 00-063966, USA.
- [R4] [http://www.interpore.org/reference\\_material/mgfc-course/](http://www.interpore.org/reference_material/mgfc-course/) [Computer mediated Distance learning course on 'Modeling Groundwater flow and Contaminant transport" by Jacob Bear].  
Chien C.C., Medina M.A., Pinder G.F., Rieble D.D., Sleep B.B., Zheng C., "Contaminated Groundwater and Sediment-Modeling for Management and Remediation", Lewis Publishers, Florida



**ENVIRONMENT ENGINEERING****Paper Code: ETCE-422****Paper: Environment Engineering**

<b>L</b>	<b>T</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 of 12.5 marks.

**Objectives:** The subject deals with primary and secondary air pollutants, monitoring and standards of various pollutants in ambient air, indoor air pollution and noise measurement, occupational noise, handling and management of municipal hazardous and bio-medical waste.

**UNIT – I**

Concept of unpolluted air, Gaseous and vapour pollutants in atmosphere, Scales of air pollution, Primary and secondary pollutants, Ambient Air Quality [AAQ], Monitoring for pollutants [SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, Particulates and their health effects. Stack monitoring for SO<sub>x</sub>, NO<sub>x</sub> and CO. Effects of air pollution on materials, structures and Human health. Air quality criteria, National air emission standards and AAQ guidelines, Indoor Air pollution. Control and management of indoor and outdoor Air pollution. Green house gases Green house effect, Global warming.

**[T1,T2][No. of Hours: 12]****UNIT – II**

**Characteristics and Sources of noise, Legal aspects:** Standards of noise, Legislation in India Types of noise: Neighborhood noise, Traffic noise, Occupational noise, Community noise, Health effects of noise, Physiological hazard and Psychological hazard. Occupational noise-exposure, Noise measuring equipments such as Sound Level Meter. Control of Noise pollution in industrial, residential and silent zone.

Sources, Composition and Properties of Municipal solid waste, Handling and Separation of solid waste, Introduction to Municipal Waste [Management and Handling Rules, 2000], Disposal of Municipal Solid Wastes.

**[T1,T2][No. of Hours: 11]****UNIT – III**

**Solid Waste Collection and Transportation:** Types of collection systems [Hauled- container system and Stationary container system], Collection routes and their Layout, Solid waste Transfer Stations. Landfills: Classification, Types and methods, site selection, site preparation. Composition, Characteristics.

**[T1,T2][No. of Hours: 11]****UNIT – IV**

Generation and Control of Landfill gases, Composition, formation, movement and control of leachate in landfills, landfill design.

**Composting:** Theory of composting, manual and mechanized composting, Characterization, Storage and Segregation of hazardous and biomedical waste Techniques of hazardous and biomedical waste management.

**[T1,T2][No. of Hours: 11]****Text Books:**

- [T1] M.N. Rao and H.V.N. Rao- Air Pollution, Tata McGraw- Hill  
 [T2] Mackenzige L. Davis, David A. Cornwell, "Introduction to environmental engineering, McGraw-Hill- International Edition.

**References Books:**

- [R1] George Tchobanoglous, Hilary Theisen, Samuel A Viquel-Integrated Solid Waste Management: Engineering, Principles and Management issues", McGraw-Hill- International Editions  
 [R2] Michael D. LaGrea, Phillip L. Buckingham, Jeffrey C. Evans-Hazardous Waste Management and Environmental Resource Management, McGraw-Hill- International Edition  
 [R3] Howard S. Peavy, Donald R. Rowe, George Tchobanoglous-Environmental Engineering, Mcrow-Hill- International Editions.  
 [R4] Lawrence K. Wang, Norman C. Pereira-Advanced Air and noise pollution control, Humana Press  
 [R5] Kenneth Wark, Cecil F. Warner-Air pollution its origin and control, PHI

**OFFSHORE STRUCTURAL ENGINEERING****Paper Code: ETCE-424****Paper: Offshore Structural Engineering**

<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 of 12.5 marks.

*Objective: To obtain expertise and specialize in Offshore Structures and subsea Engineering.***UNIT I****Concrete/composites:** Underwater concrete, mix design, quick setting compounds, high strength grout, fiber reinforced plastics, special composite materials for under water repairs.**Structural Steel:** Corrosion Mechanism; Types of corrosion; Seawater corrosion; corrosion allowance, cathodic protection design, impressed current method, sacrificial anodes design, protective coatings, splash zone protection, cathodic protection monitoring system.**Underwater repair:** Underwater welding, repair schemes for tubular members, grouted sleeve connections, and stressed – grouted connections for tubular joints.**[T1,T2][No of Hours: 12]****UNIT II****Static Structural Analysis:** Estimation of wave and current loading on framed structures; maximum base shear and overturning methods; Cyclic loads for fatigue analysis.**Dynamic Structural analysis:** Dynamic analysis of framed structures; Mode shapes and Eigen frequency analysis; Wave response; dynamic wave response; frequency and time domain analysis of risers and pipelines.**[T1,T2][No of Hours: 12]****UNIT III****Loads on offshore structures:** Wind Loads; Wave and Current Loads; Calculation based on Maximum base Shear and Overturning Moments; Design Wave heights and Spectral Definition; Hydrodynamic Coefficients and Marine Growth; Fatigue Load Definition and Joint Probability distribution; Seismic Loads.**[T1,T2][No of Hours: 11]****UNIT IV****Foundation for Offshore Structures:** Mud-mats: bearing capacity, sliding stability, over-turning stability, short term and long term settlements, factor of safety; Bucket foundation; Suction anchors; Gravity foundation.**[T1,T2][No of Hours: 10]****Text Books:**

- [T1] Mohamed Abdallah El-Reedy. Offshore Structures: Design, Construction and Maintenance, Elsevier  
 [T2] Hydrodynamics of Offshore Structures by S.K. Chakrabarti, Springer-Verlag

**References:**

- [R1] Handbook of Offshore Engineering by S.K. Chakrabarti, Elseviers, 2005.  
 [R2] Structural Stability - Theory and Implementation by W.F.Chen and E.M.Lui by Elsevier  
 [R3] Construction of Marine and Offshore Structures by Ben C. Gerwick, CRC Press, 1999.  
 [R4] Dynamics of Offshore Structures by James F. Wilson – 2003, John Wiley and Sons  
 [R5] Construction of Marine and Offshore Structures by Ben C. Gerwick, Jr – 2007, CRC Press.

**ESTIMATION OF PROJECTS USING APPLICABLE SOFTWARE**

<b>Paper Code: ETCE-452</b>	<b>L</b>	<b>T/P</b>	<b>C</b>
<b>Paper: Estimation of Projects using Applicable Software</b>	<b>0</b>	<b>2</b>	<b>1</b>

**List of Experiments:**

1. Detailed Estimate [Duration and Cost] for a two storey building.
2. Detailed estimate for following projects:
  - [i] a culvert.
  - [ii] stretch of road about 1 Km long including earthwork.
  - [iii] Elevated water tanks.
  - [iv] Manholes, Septic tanks.
  - [v] Water supply Scheme and
  - [vi] Drainage Scheme.
3. Estimate of Electrification Work for a Material Testing Laboratory.
4. Time Estimate by Network Analysis.
5. Estimation of Air Conditioning requirements for a Library.
6. Valuation reports for:
  - [i] A hotel
  - [ii] A Theatre
  - [iii] An Educational Building

**Books/References:**

1. B.N.Dutta-Estimating and Costing in Civil Engineering, UPSPD
2. Delhi Schedule Rates, C.P.W.D.

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**LAB BASED ON ELECTIVE I OR II**

Paper Code: ETCE-454

Paper: Lab based on Elective I or II

L	T/P	C
0	2	1

Based on theory course 8-10 exercises, designs/experiments.

NOTE:- At least 8 Experiments from the syllabus must be done in the semester.



**MAJOR PROJECTS**

**Paper Code: ETCE-460**  
**Paper: Major Projects**

L	T/P	C
0	12	8

Students may choose a project based on any subject of 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 will be a design project for possible implementation of project including field surveying a computer oriented project on any of the topics of civil engineering interest. It will be a group project. The topic of the project will be different from the minor project.

The assessment of the project will be done at the end of the semester by a departmental committee consisting of 3-4 faculty members/experts specialized in various fields of Civil Engineering. The students will present their project work before the committee. The complete project report is to be submitted prior to the practical exams of 8th semester. However, an interim report based on the work carried out will have to be submitted by the students within two weeks of first mid semester exam of 8th Semester to the Project Guides based on the Assessment after submission of interim report, but prior to commencement of Theory/Practical exams.

\*\*\*\*\*END\*\*\*\*\*



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