

# H.P. TECHNICAL UNIVERSITY HAMIRPUR (HP)



## Syllabus

[Effective from the Session: 2012-13]

B. Tech. (Civil Engineering)

**Group A contain:            Civil Engineering (CE)  
Information Technology (IT)  
Electronics and Communication Engg. (ECE)  
Computer Science and Engg. (CSE)**

**Group A**

**1<sup>st</sup> Semester – Scheme and Distribution of Marks**

Course No.	Subject	L	T	P/D	Hrs	Theory		Practical		Total
						End Semester	Sessional	End Semester	Sessional	
NS-101	Engineering Mathematics – I	3	1	0	4	100	50			150
NS-102	Engineering Physics-I	3	1	0	4	100	50			150
NS-103	Engineering Chemistry	3	1	0	4	100	50			150
HS-102	Communication and Professional Skills in English	3	1	0	4	100	50			150
BE-102	Basic Mechanical Engineering	3	1	0	4	100	50			150
BE-104	Principles of Computer Programming & C++	3	1	0	4	100	50			150
<b>(Practicals / Drawing / Design)</b>										
NS-103 (P)	Engineering Chemistry Laboratory	0	0	2	2			25	25	50
HS-102 (P)	Communication and Professional Skills Lab-I	0	0	2	2			25	25	50
BE-104 (P)	Computer Programming Laboratory	0	0	2	2			25	25	50
WS-101	Workshop Practice-I	0	0	3	3			25	25	50
<b>Total</b>					<b>33</b>	<b>600</b>	<b>300</b>	<b>100</b>	<b>100</b>	<b>1100</b>

**Group A**

**2<sup>nd</sup> Semester– Scheme and Distribution of Marks**

Course No.	Subject	L	T	P/D	Hours	Theory		Practical		Total
						End Semester	Sessional	End Semester	Sessional	
NS-104	Engineering Mathematics-II	3	1	0	4	100	50			150
NS-105	Engineering Physics-II	3	1	0	4	100	50			150
HS-101	Disaster Management and Environmental Science	3	1	0	4	100	50			150
BE-101	Basic Electrical and Electronics Engineering	3	1	0	4	100	50			150
BE-103	Engineering Drawing and Graphics	1	0	5	6	100	50			150
BE-105	Engineering Mechanics	3	1	0	4	100	50			150
<b>(Practicals / Drawing / Design)</b>										
NS-105 (P)	Engineering Physics Lab	0	0	2	2			25	25	50
BE-101a (P)	Basic Electrical Engineering Lab	0	0	2	2			25	25	50
BE-101b (P)	Basic Electronics Engineering Lab	0	0	2	2			25	25	50
WS-102	Workshop Practice-II	0	0	3	3			25	25	50
<b>Total</b>					<b>35</b>	<b>600</b>	<b>300</b>	<b>100</b>	<b>100</b>	<b>1100</b>

## Civil Engineering

### 3<sup>rd</sup> Semester– Scheme and Distribution of Marks

Course No.	Subject	L	T	P/D	Hrs	Theory		Practical		Total
						End Semester	Sessional	End Semester	Sessional	
HS-201	Engineering Economics	3	0	0	3	100	50			150
CE-211	Strength of Materials	3	1	0	4	100	50			150
CE-212	Building Construction and Materials	3	1	0	4	100	50			150
CE-213	Fluid Mechanics	3	1	0	4	100	50			150
CE-214	Surveying-I	3	1	0	4	100	50			150
NS-206	Engineering Mathematics-III	3	1	0	4	100	50			150
<b>(Practical / Drawing / Design)</b>										
CE-212 (P)	Building Material Laboratory	0	0	2	2			25	25	50
CE-213(P)	Fluid Mechanics Laboratory	0	0	2	2			25	25	50
CE-214(P)	Surveying-I Laboratory	0	0	2	2			25	25	50
CE-215(P)	Building Drawing	0	0	2	2			25	25	50
HS-202 (P)	Oral and Written Communication Skills Lab-II	0	0	2	2			25	25	50
<b>Total</b>					<b>33</b>	<b>600</b>	<b>300</b>	<b>125</b>	<b>125</b>	<b>1150</b>

## Civil Engineering

### 4<sup>th</sup> Semester

Course No.	Subject	L	T	P/D	Hrs	Theory		Practical		Total
						End Semester	Sessional	End Semester	Sessional	
HS-203	Human values and professional Ethics	2	0	2	4	100	50			150
NS-207	Numerical Methods for Engineers	3	1	0	4	100	50			150
CE-221	Structural Analysis-I	3	1	0	4	100	50			150
CE-222	Geotechnical Engineering-I	3	1	0	4	100	50			150
CE-223	Hydropower and Fluid Machines	3	1	0	4	100	50			150
CE-224	Surveying-II	3	1	0	4	100	50			150
<b>(Practicals / Drawing / Design)</b>										
CE-222(P)	Soil Mechanics Laboratory	0	0	2	2			25	25	50
CE-223(P)	Hydropower and Fluid Machines Laboratory	0	0	2	2			25	25	50
CE-224(P)	Surveying-II Laboratory	0	0	2	2			25	25	50
ECA-201	Extra Curricular Activity	0	0	2	2			25	25	50
<b>Total</b>					<b>32</b>	<b>600</b>	<b>300</b>	<b>100</b>	<b>100</b>	<b>1100</b>

Field Visit shall be compulsory to all students of 2<sup>nd</sup> year once in a year during or after 4<sup>th</sup> semester.

Survey camp of minimum four (4) weeks duration shall be conducted after 4<sup>th</sup> Semester for Civil Engineering students. For students of other branches community project at this level will be conducted be included. The Evaluation of same shall be done during 5<sup>th</sup> Semester.

## Civil Engineering

### 5<sup>th</sup> Semester

Course No.	Subject	L	T	P/D	Hours	Theory		Practical		Total
						End Semester	Sessional	End Semester	Sessional	
HS-301	Principles of Management and Critical Thinking	3	0	2	5	100	50			150
CE-311	Structural Analysis-II	3	1	0	4	100	50			150
CE-312	Design of Concrete Structures	3	1	0	4	100	50			150
CE-313	Geotechnical Engineering-II	3	1	0	4	100	50			150
CE-314	Hydrology and Groundwater	3	1	0	4	100	50			150
CE-315	Transportation Engineering-I	3	1	0	4	100	50			150
<b>(Practicals / Drawing / Design)</b>										
CE-311(P)	Structural Analysis Laboratory	0	0	2	2			25	25	50
CE-312(P)	Concrete Laboratory	0	0	2	2			25	25	50
HS-300	Community Project/ Survey Camp	0	0	0	0			50	50	100
<b>Total</b>					<b>31</b>	<b>600</b>	<b>300</b>	<b>100</b>	<b>100</b>	<b>1100</b>

## Civil Engineering

### 6<sup>th</sup> Semester

Course No.	Subject	L	T	P/D	Hrs	Theory		Practical		Total
						End Semester	Sessional	End Semester	Sessional	
**_300(*)	Open Elective	3	0	0	3	100	50			150
CE-321	Bridge Engineering	3	1	0	4	100	50			150
CE-322	Irrigation Engineering	3	1	0	4	100	50			150
CE-324	Transportation Engineering-II	3	1	0	4	100	50			150
CE-350	Water Supply and System Engineering	3	1	0	4	100	50			150
CE-326	Estimation and Costing	3	1	0	4	100	50			150
<b>(Practicals / Drawing / Design)</b>										
CE-320(P)	Civil Engineering Software Laboratory -I	0	0	3	3			25	25	50
CE-324(P)	Transportation Engineering Laboratory	0	0	2	2			25	25	50
CE-350(P)	Environmental Engineering Laboratory	0	0	2	2			25	25	50
<b>Total</b>					<b>30</b>	<b>600</b>	<b>300</b>	<b>75</b>	<b>75</b>	<b>1050</b>

\$\$ - Industrial Training of 8 weeks duration after 6<sup>th</sup> Semester

**Open Elective to be opted from list below but one which is not offered by his Department**

Sr. No.	Open Elective	Sub. Code
1.	Energy Assessment and Auditing	EE-300
2.	Total Quality Management	ME-300
3.	Optimization methods for Engineering System	NS-300
4.	Remote Sensing & GIS	CE-300
5.	Operating Systems	CS-300

## Civil Engineering

### 7<sup>th</sup> Semester

Course No.	Subject	L	T	P/D	Hrs	Theory		Practical		Total
						End Semester	Sessional	End Semester	Sessional	
CE-411(*)	Elective-I	3	1	0	4	100	50			150
CE-412	Design of Steel Structures	3	1	0	4	100	50			150
CE-413	Design of Hydraulic Structures	3	1	0	4	100	50			150
CE-414	Waste and Sewage Treatment	3	1	0	4	100	50			150
CE-415	Project Planning and Construction Equipments	3	1	0	4	100	50			150
<b>(Practicals / Drawing / Design)</b>										
CE-412(P)	Structural Drawing	0	0	3	3			50	50	100
CE-414(P)	Waste and Sewage Treatment Laboratory	0	0	2	2			25	25	50
CE-496	Industrial Training Viva \$\$	0	0	0	0			50	50	100
CE-497	Seminar	0	0	2	2			--	50	50
CE-498	Project-I	0	0	6	6			100	50	150
<b>Total</b>					<b>33</b>	<b>500</b>	<b>250</b>	<b>225</b>	<b>225</b>	<b>1200</b>

During winter break there shall be a field visit compulsory to all students of 7<sup>th</sup> semester, 4<sup>th</sup> year.

#### Elective-I

CE-411 (a) – Prestressed Concrete

CE-411(b) - Finite Element Methods in Civil Engineering

CE-411 (c) –Open Channel Flow

### 8<sup>th</sup> Semester

Course No.	Subject	L	T	P/D	Hrs	Theory		Practical		Total
						End Semester	Sessional	End Semester	Sessional	
CE-421(*)	Elective-II	3	1	0	4	100	50			150
CE-422	Advanced Structural Design	3	1	0	4	100	50			150
CE-423	Water Resources and System Engineering	3	1	0	4	100	50			150
CE-424	Earthquake Resistant Design	3	1	0	4	100	50			150
<b>(Practicals / Drawing / Design)</b>										
CE-420	Civil Engineering Software Laboratory -II	0	0	2	2			25	25	50
CE-499	Project-II	0	0	6	6			100	50	150
GP-500	General Proficiency	0	0	0	0			100	--	100
<b>Total</b>					<b>24</b>	<b>400</b>	<b>200</b>	<b>225</b>	<b>75</b>	<b>900</b>

#### Elective-II

CE-421 (a) – Rock Mechanics

CE-421 (b) – Remote Sensing and G I S

CE-421 (c) - Repair and Rehabilitation of Structures

**Total theory marks = 6750**

**Total practical marks = 1950**

**Grand total = 8700**

## Engineering Mathematics-I (NS-101)

<b>Course Code</b>	<b>NS-101</b>	<b>Credits- 04</b>	<b>L - 3, T- 1, P - 0</b>
<b>Name of Course</b>	<b>Engineering mathematics-I</b>		
<b>Lectures to be delivered</b>	<b>52 (L-39, T-13 for each semester)</b>		
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>
<b>Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment:</b>			<b>MM: 50.</b>
<b>30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			

### Instructions

1. The question paper will consist of five sections A, B, C, D and E. Section E will be Compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C and D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. Candidates are required to attempt five questions in all selecting one question from each of the section A, B, C and D of the question paper and all the subparts of the questions in section E. Use of non-programmable calculators are allowed.

### Section-A

#### 1. MATRICES

Matrices, Related matrices, Complex matrices (Hermitian and skew-Hermitian matrices, Unitary matrix), Consistency of linear system of equations, Rank of a matrix, Normal form of a matrix, Vectors, Linear dependence, Consistency of a linear system of equations, System of linear homogeneous equations, Linear and orthogonal transformations, Characteristic equation, Eigen values, Eigen vectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms and its reduction to canonical form.

### Section-B

#### 2. DIFFERENTIAL CALCULUS

Indeterminate forms, Taylor's and Maclaurin's series, Partial Differentiation and its geometrical interpretation, Homogeneous functions, Euler's theorem and its extension, Total differentials, Composite function, Jacobian, Maxima and minima of functions of two variables, Method of undetermined multipliers.

### Section-C

#### 3. INTEGRAL CALCULUS

Reduction formulas, Quadrature, Rectification, Surface and Volume of revolution for simple curves, Double integrals and their applications, Change of order of integration, Change of variables, Triple integrals and their applications, Change of variable, Beta and Gamma functions and their relationship.

## Section-D

### 4. COMPLEX NUMBERS

Applications of De Moivre's theorem, Root of a complex number, Exponential, Circular, Hyperbolic and Logarithmic functions of a complex variable, Inverse Hyperbolic functions, Real and imaginary parts of Circular and Hyperbolic functions, Summation of the series-'C+iS' method.

### TEXT BOOKS

1. Advanced Engineering Mathematics: by Erwin Kreyszig, John Wiley and Sons, NC, New York.
2. Advanced Engineering Mathematics: by R. K. Jain & S. R. K Iyengar, Narosa Pub. House.

### REFERENCE BOOKS

1. Advanced Engineering Mathematics: by C. R. Wylie & L. C. Barrett, McGraw Hill
2. Differential & Integral Calculus: by N. Piskunov, MIR Publications.
3. Calculus and Analytic Geometry, by Thomes, G.B, Finney, R.L. Ninth Edition, Peason Education.
4. Advanced Engineering Mathematics, by Peter. V. O" Nil, Wordsworth Publishing Company.
5. Advanced Engineering Mathematics, by Jain, R.K and Lyengar, S.R.K., Narosa Publishing Company.
6. Higher Engineering Mathematics, by Grewal, B.S., Khanna Publishers, New Delhi.
7. Engineering Mathematics, by Taneja, H.C., Volume-I & Volume-II, I.K. Publisher.

## Engineering Physics-I (NS-102)

<b>Course Code</b>	<b>NS-102</b>	<b>Credits-4</b>	<b>L-3, T-1, P-0</b>
<b>Name of the Course</b>	<b>Engineering Physics-I</b>		
<b>Lectures to be Delivered</b>	<b>52 (1 Hr Each) (L=39, T=13 for each semester)</b>		
<b>Semester</b>	<b>End</b>	<b>Max Marks: 100</b>	<b>Min Pass Marks: 40</b>
<b>Examination</b>			<b>Maximum Time: 3 hrs</b>
<b>Continuous Assessment (based on sessional test (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)</b>			<b>Max Marks: 50</b>

### Instructions

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D and E. Section E will be Compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C and D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
- 2. For Candidates:** Candidates are required to attempt five question in all selecting one question from each of the section A, B, C and D of the question paper and all the subparts of the questions in section E. Use of non-programmable calculators is allowed.

### Section A

**INTERFERENCE**-Coherent Sources, Two Beam Interference by Division of Wavefront-Fresnel Biprism Interference by Division of Amplitude - Newton's Rings, Michelson Interferometer.

**DIFFRACTION**-Fraunhofer Diffraction, Diffraction Through Single Slit, Plane Transmission Grating, Fresnel Diffraction, Fresnel Half Period Zone, The Zone Plate.

**POLARIZATION**- Production of Polarized Light, Malus's Law, Double Refraction, Interference of polarized Light: Quarter Wave Plate And Half Wave Plate.

### Section B

**Particle Properties of Waves:** Electromagnetic Waves, Maxwell Equations, Blackbody radiations, Photoelectric Effect, Compton Effect, Pair Production,

**Waves Properties of Particles:** De Broglie waves, Phase velocity, group velocity and Particle velocity. Relation between phase velocity and group velocity. Relation between group velocity and particle velocity. Particle Diffraction, Heisenberg's uncertainty principle and its physical significance (no derivation). Application of uncertainty principle (Non-existence of electron in the nucleus).

### Section C

**Quantum Mechanics:** Postulates of quantum mechanics, The Wave Equation. Properties and Physical significance of a wave function. Probability density and Normalisation of wave function. , Schrodinger's equation: Time- Dependent form, Expectation Values, Operators, Schrodinger's equation: Steady- Stateform Eigen values and eigen function, Application of Schrödinger wave equation –Particle in a box, Finite Potential well, Tunnel Effect, Harmonic oscillator.



### **Section D**

**Nuclear Structure:** Composition of nucleus, Nuclear Properties, Stable Nuclei, binding energy, Liquid Drop Model, Nuclear Forces.

**Nuclear Reactions:** Cross-section, Nuclear fission, moderators, nuclear reactors, Nuclear fusion in Stars, Fusion Reactors

**Elementary Particles:** Leptons, Hadrons, Elementary particle quantum numbers, Quarks, Field Bosons,

**Cosmology:** The Big Bang Theory, Evolution of Stars.

#### **Text Books:**

1. A.Ghatak: Optics, Tata Mcgraw Hill, 3<sup>rd</sup> edition.
2. Arthur Beiser, Concepts of Modern Physics ,6<sup>th</sup> Edition, Tata Mcgraw Hill-2009

#### **Reference Books:**

1. David J Griffith , Introduction to Electrodynamics, Pearson Prentice Hall.
2. Halliday, Resnick and Walker- Principles of Physics, Wiley India 9<sup>th</sup> Edition-2012

## ENGINEERING CHEMISTRY (NS – 103)

Course Code	NS-103	Credits- 04	L-03, T-01, P-0
Name of Course	Engineering Chemistry		
Lectures to be delivered	55 (L-42, T-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %)			MM: 50.

### Instructions

- For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
- For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**Electrochemistry:** Electrical Conductance, Types of Electrolyte, Specific Conductance, Equivalent Conductance, Molar Conductance, Ionic Conductance (Kohlrausch Law), Factors Affecting Conductance, Transport Number, Interionic Attraction Theory of Conductance, Hydration of ions, Electrochemical Cell ,Electrode Potential, Standard Electrode Potential, Galvanic Cells, EMF of the Cell & Free Energy Change, Nernst Equation, Reference Electrodes (S.H.E, Calomel Electrode, Silver-Silver Electrode, Electrochemical Series, Glass Electrode, Concentration Cell, types & applications of Concentration Cell, Batteries(primary cell, Secondary storage cell, Metal- Air Batteries), Fuel cell, hydrogen-oxygen fuel cell.

**Phase Rule:** Introduction, One Component System (water system, sulphur system) Two components System (lead-silver & Zinc- magnesium system), thermal Analysis.

### SECTION – B

Water Treatment: Introduction, Sources of water, Impurities, Hardness Analysis, Oxidations, (BOD & COD), Boiler Corrosion Sewage & Treatment.

**Corrosion and its Controls:** Introduction, Types of corrosions, Electrochemical Theory, Pitting, Water Line, Differential Aerations corrosions, Stress Corrosions, Factors affecting Corrosions, Preventive measures.

### SECTION – C

#### Instrumental Methods of Analysis

Introduction to spectroscopy; UV-Visible spectroscopy- Absorption laws ,Instrumentation, formation of absorption bands, Theory of electronic spectroscopy, Chromophore and auxochrome concept, fluorescence & phosphorescence, application of UV-Visible spectroscopy ;

IR spectroscopy- Principle, theory of molecular vibrations, important features of IR spectroscopy and applications; NMR-Principle, relaxation processes, Instrumentation, Shielding-desheilding effects, spin coupling, coupling constant, applications of NMR.

**Fuel and Combustion:** Introduction, class of fuels ( Solid, Liquid and Gases) Coal and its origin, Analysis of Coals, Petroleum fuels, Cracking, Reforming, Octane no, Cetane no, Gaseous fuel – Water gas, producer gas, bio gas, coal gas and oil gases

#### **SECTION – D**

**Polymers** Classification of polymers, types of polymerizations, plastics, some important commercial thermoplastics (polythene, polypropylene, polystyrene, polyvinylchloride, Teflon, plexiglass, polyurethanes), thermosetting (Bakelite, epoxy resin, Urea formaldehyde) Elastomers- synthetic rubbers, synthetic fibers.

#### **Composite Materials**

Introduction, Classification, Constituents of composites, Fiber reinforced composites, unidirectional fibre reinforced composites, short fibre reinforced composites, particle reinforced composites, important types of particulate composites, Failures of fiber reinforced composites, Advantages and applications of composites.

#### **TEXT BOOKS:**

1. Engineering Chemistry by Dr Ramesh Thakur and Dr.Subba Ramesh, Wiley India publisher
2. A Text Book of Engineering Chemistry by ShashiChawla, DhanpatRai& Sons.

#### **REFERENCE BOOKS:**

1. Engineering Chemistry by P C Jain & Monika Jain
2. Fundamental of organic spectroscopy by Y. R. Sharma
3. Spectroscopic methods by Williams and Fleming

## Communication & Professional Skills in English (HS-102)

<b>Course Code</b>	<b>HS-102</b>	<b>Credits-3</b>	<b>L-3, T-1, P-0</b>
<b>Name of the Course</b>	<b>Communication &amp; Professional Skills in English</b>		
<b>Semester End Examination</b>	<b>Max Marks: 100</b>	<b>Min Pass Marks: 40</b>	<b>Maximum Time: 3 hrs</b>
<b>Continuous Assessment</b> (based on Sessional test (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max Marks: 50</b>

### Instructions

- For Paper Setters:** The question paper will consist of five sections A, B, C, D and E. Section E will be Compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C and D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
- For Candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C and D of the question paper and all the subparts of the questions in section E.

### Section A

#### Essentials of communication:

The process of communication: communication competence, types and channels of communication – verbal and non-verbal, Importance of listening skills in communication: types of listening, barriers to listening, Barriers to communication and removal of these barriers, personal SWOT Analysis, Analyzing audience, role of emotions and body language in communication.

### Section B

#### Written communication:

Enriching vocabulary, using vocabulary in different contexts, Essentials of strong writing skills, language and style of writing, characteristics of a good technical style, logical reasoning, Paragraph writing, Developing perspective: goals, objectives and principles of critical thinking.

### Section C

#### Reading Comprehension:

Importance of reading: Eye movement, fixations, regression, visual wandering, right approach to reading, SQ3R method of reading, Precis writing, Comprehension, Essay writing.

### Section D

#### Technical Communication:

Report writing: Importance, structure, drafting of reports, Business Writing: Sales letters, claim and adjustment letters, inviting/sending quotations, Tenders, Memorandum, Job Application letter, Preparing a personal resume, notices, agenda and minutes of meeting.

**TEXT BOOKS:**

1. An Introduction to Professional English and Soft Skills: by Bikram K. Das, Kalyani Samantray, Cambridge Press.
2. Business correspondence and Report Writing: by R. C. Sharma & Krishna Mohan

**REFERENCE BOOKS:**

1. Communication Skills, Sanjay Kumar and PushpLata, Oxford University Press.
2. Chrissie Wright (Ed.); Handbook of Practical Communication Skills; JAICO Books
3. Effective Communication and soft Skills, NitinBhatnagar and MamtaBhatnagar, Pearson Publication.
4. Communicative English for Engineers and professionals, NitinBhatnagar and MamtaBhatnagar, Pearson Publication.
5. Communication Skills and soft skills- An integrated approach, Kumar, Pearson Publication
6. Communication Skills for Engineers, Mishra, Pearson Publication
7. K.K.Sinha, Business Communication, Galgotia Publishing Company, New Delhi, 1999.
8. R.K.Bansal& J.B. Harrison, spoken English for India, Orient Longman.

**Recommended Readings:**

1. Business @ The Speed of thought, Bill Gates.
2. My Experiments with Truth, M.K.Ghandhi
3. Wings of Fire, A.P.J. Kalam
4. An Autobiography, JwahaLal Nehru.

## BASIC MECHANICAL ENGINEERING (BE-102)

Course Code	<b>BE-102</b>	L-3, T-1, P-0	
Name of the Course	<b>Basic Mechanical Engineering</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, T = 13 for each semester)</b>		
Semester End Examination	Max. Time = 3 hrs.	<b>Max. Marks: 100</b>	<b>Min. Pass Marks: 40</b>
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.

**Note:** The paper setter will be required to mention a note in the question paper that use of steam table, graphical plots are permitted.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

### Section-A

**Basic concept:** Dimensions and units, thermodynamic systems, thermodynamic properties and process, thermodynamic equilibrium, energy-kinetic, potential and internal, heat and work, zeroth law, concept of temperature, definition of ideal gas, laws and properties of ideal gas.

**First law of Thermodynamics:** First law for control mass (closed system), internal energy as a property, enthalpy, specific heats, non-flow processes of ideal gases, cyclic process, first law for control volume (open system), applications of steady flow energy equation to engineering devices.

### Section-B

**Second law of Thermodynamics:** Limitations of first law of thermodynamics, Kelvin- Planck and Clausius statements, their equivalence, application of statements of second law to heat engine, heat pump and refrigerator, reversible processes, reversible cycles, and carnot cycle, corollaries of the second law, thermodynamics temperature scale, Clausius inequality, entropy, principle of increase of entropy, availability and irreversibility.

**Properties of Steam:** Phase transformation, phase diagram, condition of steam- saturated steam, dry-saturated steam, wet steam, superheated steam, dryness fraction, property of steam, steam tables, use of Mollier charts , process of vapors and various process.

### Section-C

**Gas Power Cycles:** Carnot, Diesel, Otto, Dual combustion, working of 2-stroke and 4-stroke engine, Air standard thermal efficiency, Concepts of mean effective pressure, indicated power and brake powerfor reciprocating engines.

### **Section-D**

**Introduction of Psychometry:** The Gibbs Dalton law, Psychometric terms, Introduction of Psychometry Chart.

**Introduction to Heat Transfer:** Mechanisms – Conduction, Convection and Radiation, Introduction to Fourier's Law of heat conduction, Newton's law of cooling, Stefan-Boltzmann law.

**Introduction to Fluid Mechanics:** Fluid, properties of fluid, viscosity, Newton's law of viscosity, surface tension, types of fluid, buoyancy.

#### **TEXT BOOKS:**

1. Basic Mechanical Engineering by Basant Aggarwal and CM Aggarwal Wiley India.
2. Fundamentals of Mechanical Sciences: Engineering Thermodynamics and Fluid Mechanics by Mukherjee and Paul, PHI Learning.

#### **REFERENCE BOOKS:**

1. Thermodynamics – An Engineering Approach (SI Units) – Yunus. A. Cengel, Michael A. Boles, TMH New Delhi
2. Fundamentals of Thermodynamics –Sonntag, Borgnakke Van Wylen – Wiley India.
3. Engineering Thermodynamics by P.K. Nag, TMH, New Delhi
4. Thermodynamics by C.P. Arora, TMH, New Delhi
5. Fundamentals of Mechanical Engineering, 2<sup>nd</sup> Edition by G.S. Sawhney, PHI Learning Private Limited.

## Principle of Computer Programming & C++ (BE-104)

<b>Course Code</b>	<b>BE-104</b>	<b>Credits-4</b>	<b>L-3, T-1, P-0</b>
<b>Name of the Course</b>	<b>Principle of Computer Programming &amp; C++</b>		
<b>Lectures to be Delivered</b>	<b>52 (1 Hr Each) (L=39, T=13 for each semester)</b>		
<b>Semester End Examination</b>	<b>Max Marks: 100</b>	<b>Min Pass Marks: 40</b>	<b>Maximum Time: 3 hrs</b>
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max Marks: 50</b>

### SECTION-A

**Introduction to Computer:**-Definition, Characteristics..Generation of Computers, Capabilities and Limitations.Introduction to Operating System.Basic Components of a Computer System- Control Unit, ALU, Input/output functions and characteristics. Memory Introduction, Classifications- Volatile Memory and Non- Volatile , Memory, ROM, RAM.

**Input, Output and storage Units:**-Computer Keyboard, Pointing Devices: Mouse, Trackball, Touch Panel, and Joystick, Light Pen, Scanners, Various types of Monitors.

**Hard Copy Devices:**- Impact and Non- Impact Printers- Daisy Wheel, Dot Matrix, Line Printer, Chain Printer. Non Impact Printers- DeskJet, Laser Printer, Virus : General introduction of virus and anti-virus .

### SECTION-B

**High Level Language and Low Level Language,** Software and its different types- System Software, Application software.Compiler, Interpreter and Assembler. Introduction to algorithm and Flow chart: - Representation of an algorithm, flowchart symbols and flow chart, rules, advantage and limitations of flowchart and pseudo code. Testing and Debugging:-Definition of testing and debugging , types of program errors.

**DOS :** Internal and External Commands , Difference between External and Internal Commands.

### SECTION-C

**Introduction to C++ :**Starting with C++, Features of C++ Procedure-oriented programming OOP vs. procedure-oriented programming Compiling, linking and running a C++ program.

**Object-Oriented Programming Concepts:** Abstraction , Inheritance, Polymorphism, Data Binding , Encapsulation., Classes and Objects Concept of a class ,Defining a class, Creating an object , Object Scope.

**The Basics of C++ :**Basic Data Types, User-defined Data Types, Variable Declarations, Variable Names Constants and its types , Character Constants , String Constants, Standard input and standard output Formatted input –cin and Formatted output – cout.

**Working with Operators and Expressions:** Operators, Arithmetic Operators, Relational Operators, Assignment Operator, Logical Operators, Increment and Decrement Operators (++ and --), 'Operate-Assign' Operators (+, =, ...).



## SECTION-D

**Controlling the Program Flow:** Decision control : if, if – else, if - else if . Loop Control : while, do – while, for, break,continue Case Control switch, goto.

**Functions/Procedures:** function,Returning values from functions,Arguments Passed by ValuePassing Addresses of Arguments,Concept of variable scope and scope rules,Global variables

**Pointers and Arrays:** Pointers,Pointer Initialization,Pointer Operators ,The & (and) Operator Understanding Arrays, Initializing Arrays.

**Files:** reading, writing text and binary files, pointers, character pointers, pointers to arrays, arrays of pointer to structures.

### TEXT BOOKS:

1. Fundamentals of Computers by Rajaraman, V., PHI Publication
2. Object oriented programming in C<sup>++</sup> by Rajesh K. Shukla, Wiley India.

### REFERENCE BOOKS

1. The C<sup>++</sup> programming language ,Bjarne Stroustrup ,Addison Wesley , 2000.
2. Basic Computer Engineering, Kogent learning solution Inc. Dreamtech Press.
3. Object oriented programming Principles and Fundamental, Gim Keogh and Mario Giannini, John Wiley.
4. Object oriented programming in turbo C<sup>++</sup>, Robbet Lofre, 4 Ed Pearson Publication.
5. Programming with C<sup>++</sup>, D. Ravichandern, Tata Mcgraw Hill 1996.
6. Object oriented programming in C<sup>++</sup>, Nicolai M Josuetis, John Wiley.

## Engineering Chemistry Lab (NS-103(P))

Course Code	NS-103(P)	Credits-2	L-0, T-0, P-2
Name of the Course	Engineering Chemistry Lab		
Lectures to be Delivered	26 hours of Lab. work (2 hrs. per week)		
Semester End Examination	Max Marks: 25	Min Pass Marks: 10	Maximum Time: 3 hrs
Continuous Assessment	Lab work 30%	Lab Record 25%	Max Marks: 25
	Viva/ Hands on 25%	Attendance 20%	

### Instructions for paper setter / candidates

Laboratory examination will consist of two parts:

Performing a practical exercises assigned by the examiner.

Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

**NOTE: At least 10 to 12 experiments to be performed.**

### List of Experiments

1. To determine the surface tension of the given liquid by drop number method by using stalgmometer and identify the given liquid.
2. To determine the insoluble, soluble and total solids in given sample of sewage.
3. To determine the solid carbon, volatile matter, ash content and percentage of moisture in given sample of coal by proximate analysis method and classify the coal.
4. To determine the total alkalinity in a given sample of water using a standard acid.
5. To determine the percentage of Chlorine in a given sample of  $\text{CaOCl}_2$  which has been dissolved in one litre of solution..
6. To determine the surface tension of the two given unknown liquids by using Stalgmometer and identify the given liquid.
7. To determine the coefficient of viscosity of the given unknown liquids by using Ostwald's Viscometer and identify the given liquid.
8. To determine the coefficient of viscosity of the given lubricating oil using Red Wood Viscometer
9. To determine the coefficient of viscosity of the given lubricating oil using Seybolt Viscometer.
10. To determine the flash point and fire point of given sample of oil using Pens key Marten's apparatus.
11. To determine the amount of Chlorine in given sample of water approximate N/20 sodium Thiosulphate solution.
12. To determine the maximum wavelength of solution of cobalt chloride
13. To determine the Beer's Law and apply it to find the concentration of given unknown solution by spectra-photometer.
14. To determine the chemical oxygen demand of waste water.
15. To determine the half-life period of given radioactive sample using GM counter.

## Communication & Professional Skills Lab-I (HS-102(P))

<b>Course Code</b>	<b>HS-102 (P)</b>	<b>Credits-2</b>	<b>L-0, T-0, P-2</b>		
<b>Lectures to be Delivered</b>	<b>26 hours of Lab. work (2 hrs. per week)</b>				
<b>Semester End Examination</b>	<b>Max Marks: 25</b>	<b>Min Pass Marks: 10</b>	<b>Maximum Time: 3 hrs</b>		
<b>Continuous Assessment</b>	<b>Lab work</b>	<b>30%</b>	<b>Lab Record</b>	<b>25%</b>	<b>Max Marks: 25</b>
	<b>Viva/ Hands on</b>	<b>25%</b>	<b>Attendance</b>	<b>20%</b>	

### **Instructions for paper setter / candidates:**

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner .
- (ii) Viva-voce examination

Note: Each practical should be performed twice for effectiveness.

### List of Practicals:

1. Word processing a document.
2. Power point presentations.
3. Resume / Biodata preparation
4. Report writing.
5. Preparing notice, agenda and minutes of meeting.
6. Preparation of Quotation and tender document
7. Note making based reading comprehension
8. Précis Writing

### Recommended books:

1. English Conversation Practice by Grant Taylor
2. Business correspondence and Report Writing: by R. C. Sharma & Krishna Mohan
3. Chrissie Wright (Ed.); Handbook of Practical Communication Skills; JAICO Books.
4. Veena Kumar, The Sounds of English, Makaav Educational Software, New Delhi.

## Computer Programming Laboratory (BE-104(P))

<b>Course Code</b>	<b>BE-104 (P)</b>	<b>L-0, T-0, P-2</b>	
<b>Name of the Course</b>	<b>Computer Programming Laboratory</b>		
<b>Lectures to be Delivered</b>	<b>26 Hrs. of Lab work (2hrs. each per week)</b>		
<b>Semester End Examination</b>	<b>Max Marks: 25</b>	<b>Min Pass Marks: 10</b>	<b>Maximum Time: 3 hrs</b>
<b>Continuous Assessment</b>	<b>Lab work 30%</b> <b>Viva 25%</b>	<b>Lab Record 25%,</b> <b>Attendance 20%</b>	<b>Max Marks: 25</b>

### Instructions for paper setter / candidates

Laboratory examination will consist of two parts:

Performing a practical exercises assigned by the examiner.

Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

**NOTE: At least 10 to 12 experiments to be performed.**

### List of Experiments

1. Write a Program to find the sum, difference, product and quotient of two integers.
2. Write a program C++ Program to output an integer, a floating point number and a character.
3. Write a program to switch between different cases.
4. Write a program to count the number of words and characters in a sentence.
5. Program to find the roots of a quadratic equation.
6.
  - Create a class rational which represent a numerical value by two double values numerator and Denominator include the following public members functions
  - Constructor with no argument(default)
  - Constructor with two arguments
  - Void reduce ()that reduce the rational number by eliminating the highest common factor between the numerator and the denominator
  - Overload + operator to add two rational numbers
  - Overload >> operator to enable input through cin.
  - Overload << operator to enable input through cout.
7. Write a program to convert days into years and weeks.
8. Write a program to convert temperatures from Celsius to Fahrenheit and vice versa.
9. Write a program to find the sum of either of the diagonals of a 4 x 4 matrix.
10. Write a program to enter a sentence and output the number of uppercase & lowercase consonants, uppercase & lowercase vowels in sentence.
11. Write a program to enter 10 integers in a single-dimension array and then print out the array in ascending order.
12. Write a program to find the sum of each row & column of a matrix of size n x m and if matrix is square, find the sum of the diagonals also.
13. Write a program to display fibonacci series upto n terms.

14. Write a program for payroll system using inheritance.
15. To calculate the total mark of a student using the concept of virtual base class.
16. Program for Write File Operation Using C++ Programming.
17. Write a program that creates a binary file by reading the data for the student for the terminal .The data of each student consist of roll number, name (a string of thirty or lesser number of characters ) and marks.
18. Write a program to read a number and display its square, square root, cube and cube root. Use a virtual function to display any one of the above.
19. Write a program to read two matrix and find their product use operator overloading so that the statement for multiplying the matrix may be written as  $Z=x*y$  where x,y,z are matrices.

## WORKSHOP PRACTICE-I (WS-101)

Course Code	WS– 101	L-0, T-0, P-3
Name of the Course	Workshop Practice –I	
Lectures to be delivered	39 hours of Lab sessions in each semester	
Semester End Examination	Max. Marks: 25	Min. Pass Marks: 10
Continuous Assessment	Lab work 30%, Viva 25%,	Lab record 25%, Attendance 20% Max. Marks: 25

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner .
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

### List of Experiments: -

#### Fitting Shop: -

Introduction to the tools used in Fitting Shop and various processes in Fitting shop.

1. To make a square piece of mild steel.
2. To make V-matching joint of mild steel.
3. To make a V-notch.

#### Machine Shop: -

Introduction to various machine tools and machine parts, such as Lathes, drilling machine, grinders etc. Cutting tools and operations.

1. Facing and turning on mild steel rod on Lathe Machine.
2. To make a groove on lathe machine.
3. Taper turning operation on Lathe Machine.

#### Carpentry and Pattern making Shop: -

Carpentry and Pattern Making Various types of timber and practice boards, defects in timber, seasoning of wood, tools, operations and joints. Introduction to the tools used in carpentry shop.

1. To make the 'T' lap joint.
2. To make 'T' Dove-tail joint.
3. To make Mortise &Tennon joint.

#### Welding Shop: -

Introduction to different welding methods, welding equipment, electrodes, welding joints, awareness of welding defects.

1. To make a lap joint.
2. To make a T joint.
3. To make a V-butt joint.

**Smithy and Forging: -**

Introduction to forging tools, equipments, and operations, Forgability of metals.

1. To make a ring of mild steel by cold forging process.
2. To make S-hook by hot forging process.
3. To make chisel by hot forging process.

**Foundry Shop: -**

Introduction to moulding materials, moulds, use of cores, melting furnaces, tools and equipment used in Foundry.

1. Make a single piece pattern mould.
2. To make split pattern mould.
3. To make mould and core and assemble it.

**Electrical and Electronics Shop: -**

Demonstration of tools, Introduction to electric wiring, Exercises preparation of PCBs, involving soldering of electrical & electronic application.

1. Fault rectification, disassembly and assembly of (any two) electrical appliances viz. electric iron, electric mixer, ceiling and table fan, tube light, blower and water heater.
2. Demonstration and use of following electronic instruments: multimeter, voltmeter, ammeter, energy meter, CRO.

**Suggested Reading: -**

1. Workshop Technology by Chapman.
2. Manufacturing Processes by Begman.
3. Manufacturing Materials and processes by JS Campbell.
4. Mechanical Workshop Practice, 2<sup>nd</sup> Edition by John, PHI Learning Private Limited.

**Semester –II**  
**Engineering Mathematics-II (NS-104)**

<b>Course Code</b>	<b>NS-104</b>	<b>L - 3, T- 1, P - 0</b>	
<b>Name of Course</b>	<b>Engineering mathematics-II</b>		
<b>Lectures to be delivered</b>	<b>52 (L-39, T-13 for each semester)</b>		
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>
<b>Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment:</b>			<b>MM: 50.</b>
<b>30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			

**Instructions**

1. The question paper will consist of five sections A, B, C, D and E. Section E will be Compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C and D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. Candidates are required to attempt five questions in all selecting one question from each of the section A, B, C and D of the question paper and all the subparts of the questions in section E. Use of non-programmable calculators are allowed.

**Section-A**

**INFINITE SERIES:** Convergence and divergence of infinite series, Geometric series test, Positive term series, p-series test, [Comparison test, D’Alembert’s ratio test, Cauchy’s root test (Radical test), Integral test, Raabe’s test, Logarithmic test, Gauss’s test] (without proofs), Alternating series and Leibnitz’s rule, Power series, Radius and interval of convergence, absolute convergence and Conditional convergence.

**Section-B**

**FOURIER SERIES:** Euler’s formula, Conditions for a Fourier expansion, Dirichlet’s conditions, Functions having points of discontinuity, Change of interval, Odd and even periodic functions, Expansion of odd and even periodic functions, Half-range series, Typical wave-forms, Parseval’s formula.

**Section-C**

**LINEAR DIFFERENTIAL EQUATIONS:** Brief review of first order ordinary differential equations, Exact equations, Equations reducible to exact equations, Equations of the first order and higher degree, Clairaut’s equation, Linear differential equations with constant co-efficients, Complimentary functions and particular integral, Method of variation of parameters, Equations reducible to linear equations with constant co-efficients (Cauchy’s and Legendre’s linear equations).

**Section-D**

**VECTOR CALCULUS:** Curves in space, curvature and torsion, Scalar and vector point functions, Differentiation of vectors, Vector operator Del, gradient, divergence and curl with their physical interpretations, Formulae involving gradient, divergence and curl, Line, surface



and volume integrals, Green's Theorems, Stokes and Gauss Theorems and their verifications and applications. Scalar potential, solenoidal and irrotational fields.

### **TEXT BOOKS**

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley and Sons, N.C., New York.
2. Advanced Engineering Mathematics by R. K. Jain & S. R. K Iyengar, Narosa Publishing House.

### **REFERENCE BOOKS**

1. Advanced Engineering Mathematics: by C. R. Wylie & L. C. Barrett, McGraw Hill
2. Higher Engineering Mathematics by B S Grewal, Khanna Publishers, New Delhi.
3. Differential & Integral Calculus: by N. Piskunov, MIR Publications.
4. Calculus and Analytic Geometry by Thomas, G.B, Finney, R.L. Ninth Edition, Pearson Education.
5. Advanced Engineering Mathematics by Peter. V. O'Neil, Wordsworth Publishing Company.
6. Vector Calculus by C. E. Weatherburn. John Wiley and Sons, NC, New York.
7. Differential Equations by Shepley L. Ross, John Wiley & Sons, New York.

## Engineering Physics– II(NS – 105)

Course Code	NS-105	L-3, T-1, P-0	
Name of the Course	Engineering Physics– II		
Lectures to be delivered	52 (1Hr.each) (L = 39, T = 13 for each semester)		
Semester End Examination	Max. Time: 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
Continuous Assessment (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	Max. Marks: 50		

### Instructions

- For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
- For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

### SECTION – A

**Crystal Structure:** Space lattice, Bravais lattice - unit cell, primitive cell. Lattice parameters. Crystal systems. Direction and planes in a crystal. Miller indices. Expression for inter-planar spacing. Co-ordination number. Atomic packing factor. Bragg's Law. Determination of crystal structure by Bragg's x-ray spectrometer. Crystal structures of NaCl, and diamond.

**Free electron theory:** Elements of classical free electron theory and its limitations. Quantum theory of free electrons, Fermi level, density of states, fermi-dirac distribution function, Thermionic emission, Richardson's equation.

(10 Lectures) & (Text Book-1)

### SECTION – B

**Band Theory of Solids:** Origin of energy bands, Periodic Potential in a crystal, Wave function in a periodic potential, Kronig-Penney Model (qualitative), E-K diagrams, Brillouin Zones, Effective mass of electron, Concept of negative effective mass and holes, Classification into metals, semiconductors and insulators, Fermi energy and its variation with temperature.

(9 Lectures) & (Text Book-1)

### SECTION – C

**Dielectric and Magnetic Properties of Materials:** Dielectric polarization, dielectric constant, types of polarization, electric field, electric displacement and dielectric polarization vector & relation between them, Gauss's law in the presence of dielectric, Behavior of dielectric in alternating field- simple concepts, Atomic Magnetic Moments, Classification of magnetic materials, Dia, para, and ferromagnetic materials, domains, B-H graph in ferromagnetic materials Anti-ferromagnetism & ferrimagnetisms, . Soft and Hard magnetic materials. Ferrite and their applications.

**Superconductivity:** Temperature dependence of resistivity in superconducting materials. Effect of magnetic field (Meissner effect). Type I and Type II superconductors. BCS theory (qualitative), High temperature superconductors, Applications of superconductivity.

**(12 Lectures) & (Text Book-1)**

#### **SECTION – D**

**Lasers:** Spontaneous and stimulated emission, Einstein's Coefficients, Characteristics of Laser beam, Population inversion, Pumping Techniques, Components of a laser system, Ruby Laser and He-Ne Lasers

**Fiber Optics:** Basics of fiber optics, Total Internal Reflection, Acceptance angle, Numerical aperture, Single mode & Multimode fibres, Step index and Graded index fiber, pulse Dispersion in optical fibres, Attenuation in Optical Fibres, applications of optical fibres.

**(8 Lectures) & (Text Book-2)**

#### **Text Books:**

1. Rajnikant: Applied Solid State Physics, Wiley India Pvt Ltd.
2. A. Ghatak: Optics, Tata Mcgraw Hill, 3<sup>rd</sup> edition.

#### **Reference Books:**

1. Charles Kittel: Introduction to Solid State Physics, John Wiley & sons Inc.
2. S. O. Kasap, Principle of Electronic materials and Devices.

## DISASTER MANAGEMENT AND ENVIRONMENTAL SCIENCE (HS-101)

Course Code	<b>Hs-101</b>	L-3, T-1, P-0	
Name of the Course	<b>Disaster Management and Environmental Science</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, P = 13 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

#### Section-A

Principles of Disaster Management. Natural Disasters such as Earthquake, Floods, Fire, Landslides, Tornado, Cyclones, Tsunamis, Nuclear, Chemical, Terrorism, Extra Terrestrial and other natural calamities. Hazards, Risks and Vulnerabilities. Assessment of Disaster Vulnerability of a location and vulnerable groups, National policy on disaster Management,

#### Section-B

Prevention, Preparedness and Mitigation measures for various Disasters, Post Disaster Relief & Logistics Management, Emergency Support Functions and their coordination mechanism, Resource & Material Management, Management of Relief Camp, Information systems & decision making tools, Voluntary Agencies & Community Participation at various stages of disaster, management, Integration of Rural Development Programmes with disaster reduction and mitigation activities.

#### Section-C

Renewable and non-renewable resources, Role of individual in conservation of natural resources for sustainable life styles. Use and over exploitation of Forest resources, Deforestation, Timber extraction, Mining, Dams and their effects on forest and tribal people. Use and over exploitation of surface and ground water resources, Floods, Drought, Conflicts over water, Dams- benefits and problems. Causes, effects and control measures of Air pollution, Water pollution, soil pollution, Noise pollution, Thermal pollution, Nuclear hazards.

### **Section-D**

Global Environmental crisis, Current global environment issues, Global Warming, Greenhouse Effect, role of Carbon Dioxide and Methane, Ozone Problem, CFC's and Alternatives, Causes of Climate Change Energy Use: past, present and future, Role of Engineers.

#### **TEXT BOOKS:**

1. Disaster Management By G. K. Ghosh A.P.H. Publishing Corporation
2. Environmental Studies, R Rajgopalan, Oxford University Press

#### **REFERENCE BOOKS:**

1. Modern Encyclopaedia of Disaster and Hazard Management By B C Bose Rajat publications.
2. Disaster Management By R.B. Singh Rawat Publications.
3. Disaster Management By B Narayan A.P.H. Publishing Corporation.
4. Environmental Studies, Daniels, Wiley Publication
5. Environmental Studies, Basak, Pearson Publication

## Basic Electrical & Electronics Engineering (BE-101)

<b>Course Code</b>	<b>BE-101</b>	<b>L-3, T-1, P-0</b>	
<b>Name of the Course</b>	<b>Basic Electrical &amp; Electronics Engineering</b>		
<b>Lectures to be delivered</b>	<b>52 (1 Hr Each) (L = 39, T = 13 for each semester)</b>		
<b>Semester End Examination</b>	<b>Max. Time: 3 hrs.</b>	Max. Marks: 100	Min. Pass Marks:40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max. Marks: 50

### Instructions

- For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
- For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

### SECTION A

**DC circuits:** Ohm's law, resistance, receptivity, series & parallel connections, star delta transformation, power dissipation in resistance, effect of temperature on resistance. Kirchhoff's laws Mesh laws; Mesh & Nodal analysis.

**AC circuits:** Generation of alternating voltage & currents, Sinusoidal signals, instantaneous and peak values, R.M.S. & Average value, phase angle, polar and rectangular, exponential and trigonometric representations of RL and C components,

**Electrical Instruments and Devices:** Voltmeter, Ammeter, Wattmeter, Energy meter, Inverters. Introduction to Domestic Electric Wiring

### SECTION – B

**Series and Parallel Circuits:** A.C. Through resistance; inductance & capacitance. R-L; R-C & R-L-C series & parallel circuits, phasor diagrams. Power & power factor, series & parallel resonance. Problems by analytical as well as physical methods.

**Three phase circuits:** Three phase voltage & current generation, star & delta connections (balanced load), relationship between phase & line currents and voltages, phasor diagrams, measurement of power by two wattmeter methods.

**A.C. And D.C. Machines:** Principle, construction and working of transformer. Introduction to D.C and A.C. machines.

### SECTION – C

**Semiconductor Devices & Circuit:** Classification of material; Energy band structure of conductors, insulators & semiconductor; Classification of Semiconductor Mobility and conductivity, Intrinsic and extrinsic semiconductors and charge densities in semiconductors, current components in semiconductors, continuity equation. ; PN junction Characteristics &

Analysis ;diode rating ; Types of diodes – Zener diodes, Photodiodes, Light emitting diodes (LED's), Varactor diodes and tunnel diodes. Rectifiers and filter circuit: Half wave, full wave and Bridge rectifier circuits and their analysis, L, C and Pi filters, Basic regulator supply using zener diode.

**Transistors:** Construction and characteristics of bipolar junction, transistors (BJT's)-Comm. Base, Comm. emitter, Comm. Collector configuration.

#### **SECTION – D**

**Field Effect Transistor:** Construction and characteristics of JFET.MOSFET construction and characteristics.

**Integrated Circuits:** Classification Of ICs; Monolithic ICs; OP Amp: Characterstics of Ideal OPamp& application

**Electronic Instruments:** Role and importance of general purpose test Instruments, Electronic Millimeter, Cathode Ray Oscilloscope, Measurement of amplitude, Frequency and phase using CRO.

#### **TEXT BOOKS:**

1. Basic Electrical & Electronics Engineering –V Jegathesan, K Vinoth Kumar & R Saravanakumar, Wiley India
2. Basic Electrical & Electronics Engineering- B.L.Thereja
3. Fundamentals of Electrical & Electronics Engg. 2nd Edition by Smarajit Ghosh, PHI Learning Private Limited.

#### **REFERENCE BOOKS:**

1. Electronics devices and circuit theory by Robert Boylestad.
2. Electronics Devices and circuits by Millman&Halkias, TMH.
3. Basic Electronics by Debashis De, Pearson Education, 2010.
4. Electronics devices and circuit by Bhargava and Kulshreshta, TTTI Series

## ENGINEERING MECHANICS (BE-105)

Course Code	BE – 105	L-3, T-1, P-0	
Name of the Course	Engineering Mechanics		
Lectures to be delivered	52 (1 Hr Each) (L = 39, T = 13, P=0 for each semester)		
Semester End Examination	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max. Marks: 50

### INSTRUCTIONS:

- For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus, and each question will carry 20% of the total marks of the semester end examination for the course.
- For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

#### Section-A

**Force, Moment, Center of gravity & Moment of Inertia:** Idealization of Mechanics, Concept of Rigid Body and Elastic Body, Laws of Mechanics, Forces & System of Forces, Composition, Resolution & resultant of Forces, Laws of Forces, Lami's Theorem, Moment & Couples, Varignon's Theorem, Free Body Diagram, Centre of Gravity of a Lamina, Centroids of various Geometric Shapes, Moment of Inertia, Radius of Gyration, Parallel and Perpendicular Axis Theorem.

**Frames and Trusses:** Introduction, Perfect Frame, Redundant Frame, Reactions of Supports, Plane Trusses, Space Trusses, Method of Joints, Method of Section, Graphical Method- Maxwell Diagram.

#### Section-B

**Simple Stresses and Strains:** Stress & strain; Types of stresses and strains Elastic limit; Hooks law; Stress – strain diagram for ductile and brittle material, Factor of safety; Poisson's ratio; Elastic constants; Young's modulus, Shear modulus & Bulk modulus. Relationship between elastic constants. Thermal Stress & Strain.

**Shear Force and Bending Moment:** Concept of beams - statically determinate and indeterminate beams, Concept and definition of shear force and bending moment, Sign conventions, Types of load – concentrated, uniformly distributed, uniformly varying, Types of beams: Cantilever beam, simply supported beam, overhanging beam; Shear force and bending moment diagrams for the above beams subjected to different loadings and couples. Point of contra flexure, Relationship between load, Shear force and bending moment.



### **Section-C**

**Bending Stresses in Beams:** Bending Stresses in Beams with derivation of Bending equation and its application to beams of circular, rectangular I & T Section, Composite beams.

**Shearing Stresses in Beams:** Shearing stress at a section in a loaded beam, Shear stress distribution over different sections.

### **Section-D**

**Torsion of Circular Shaft:** Introduction, Theory of Pure torsion - Derivation of torsion equation, assumptions made in theory of pure torsion, Maximum torque transmitted by Solid and hollow shafts, Polar modulus, Torsion rigidity, Power transmitted by a shaft, Comparison of hollow and solid shaft subjected to pure torsion, Close coiled helical spring subjected to axial load and torque.

**Introduction to Friction:** Definition, Principles of friction, Friction between solid bodies, Coefficient of friction, Kinetic friction force, Definition & Determination of angle of friction, Laws of friction, Procedure for friction analysis, Equilibrium of rigid bodies subjected to frictional force of resistance, Friction at the ends of ladder, Wedge friction, Remedial measures in overcoming friction.

#### **TEXT BOOKS:**

1. Engineering Mechanics-Nelson, McGraw Hill
2. Engineering Mechanics: Statics, Meriam, JohnWiley

#### **REFERENCE BOOKS:**

1. Mechanics of Materials-E.J. Hearn, Elsevier
2. Engineering Mechanics-Bhavikatti, New Age International
3. Engineering Mechanics- JagatBabu, Pearson
4. Engineering Mechanics, P.N. Chandramouli, PHI Learning Private Limited.
5. Engineering Mechanics, V. Jayakumar & M. Kumar, PHI Learning Private Limited.

## ENGINEERING DRAWING AND GRAPHICS (BE-103)

Course Code	BE-103	L-1, T-0, P-5	
Name of the Course	Engineering Drawing and Graphics		
Lectures to be delivered	78 (1 Hr Each) (L = 13, P = 65 for each semester)		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

1. **For Institutes:** There will be two sessions per week. 1<sup>st</sup> session will consist of one lecture and two hours of practice session. 2<sup>nd</sup> session will consist of three hours of practice session.
2. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
3. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

### Section-A

**Drawing Techniques and Scales:** Various type of lines, principal of dimensioning, size and location as per IS code of practice (SP-46) for general Engg. Drawing. Practice of drawing, various types of lines and dimensioning exercises. Drawing exercises pertaining to symbols. Conventions and Exercise of lettering techniques. Free hand printing of letters and numerals in 3, 5, 8 and 12 mm sizes, vertical and inclined at 75 degree. Instrumental lettering in single stroke. Linear scale, Diagonal scale & vernier scale.

**Points, Lines and Planes:** Projection of Points, Lines and Planes: Concept of horizontal and vertical planes. First and third angle projections: projections of point and lines, true length of lines and their horizontal and vertical traces, projection of planes and their traces. Auxiliary planes.

### Section-B

**Projections of Solids:** Right regular solids of revolution and polyhedrons etc. and their auxiliary views.

**Sectioning of Solids:** Principal of sectioning, types of sectioning and their practice on projection of solids, sectioning by auxiliary planes.

### Section-C

**Development of Surfaces:** Development of surfaces of cylinders, cones, pyramid, prism etc. exercises involving development of unique surfaces like Y-piece, hopper, tray, truncated pieces etc.

**Intersection of Surfaces:** Intersection of cylinders, cones and prisms with their axes being vertical, horizontal or inclines. Exercise on intersection of solids-cylinder and cylinder, cylinder and cone, prism and prism.

#### **Section-D**

**Isometric Projection:** Concept of isometric views: isometric scale and exercise on isometric views. Practice of Orthographic projections.

**Simple Trusses:** Graphical Method.

#### **TEXT BOOKS:**

1. Engineering Drawing & Engg. Graphics by P. S. Gill, Kataria and Sons Millennium Edition.
2. Engineering Drawing Plane and Solid Geometry by N.D. Bhatt and V. M. Panchal, 44th Edition, 2002, Charotar Publishing House.

#### **REFERENCE BOOKS:**

1. Engineering Drawing by Dhananjay A. Jolhe, Tata McGraw Hill.

## Engineering Physics Lab (NS-105(P))

Course Code	NS-105(P)	L-0, T-0, P-2	
Name of the Course	Engineering Physics Lab		
Lectures to be Delivered	26 hours of Lab. work (2 hrs. per week)		
Semester End Examination	Max Marks: 25	Min Pass Marks: 10	Maximum Time: 3 hrs
Continuous Assessment	Lab work 30%, Viva/ Hands on 25%	Lab Record 25% Attendance 20%	Max Marks: 25

### Instructions for paper setter / candidates

Laboratory examination will consist of two parts:

Performing a practical exercises assigned by the examiner.

Viva-voce examination

Viva-voce examination will be related to the practicals performed/project executed by the candidate related to the paper during the course of the semester.

### List of Experiments

1. To find the refractive index of a prism by using spectrometer.
2. To find the wavelength of sodium light by Newton's rings experiment.
3. To find the wavelength of sodium light by Michelson interferometer.
4. To study the laser beam characteristics like, wavelength using diffraction grating aperture & divergence.
5. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus.
6. To find the value of  $e/m$  for electrons by Helical method.
7. To compare the capacitances of two capacitors by De'sauty Bridge.
8. To find the value of Planck's constant by using a photoelectric cell.
9. To calculate the hysteresis loss by tracing a B-H curve for a given sample
10. To determine the Hall co-efficient
11. To determine the band gap of an intrinsic semiconductor by four probe method.
12. To find the velocity of ultrasound in liquid.
13. To find out polarizability of a dielectric substance.
14. To determine the numerical Aperture of an optical fibre.
15. To determine the attenuation & propagation losses in optical fibres.

**Note: Each student is required to perform at least ten experiments.**

### Books:

1. Practical Physics-S.L.Gupta&V.Kumar.
2. Advanced Practical Physics Vol. I & II – S.P. Singh

## **BASIC ELECTRICAL ENGINEERING LAB (BE– 101a(P))**

Course Code	<b>BE– 101a(P)</b>	L-0, T-0, P-2	
Name of the Course	<b>Basic Electrical Engineering Lab</b>		
Lectures to be Delivered	26 hours of Lab. work (2 hrs. per week)		
Semester End Examination	Max Marks: 25	Min Pass Marks: 10	Maximum Time: 3 hrs
Continuous Assessment	Lab work 30%, Lab Record 25%	Viva/ Hands on 25%, Attendance 20%	Max Marks: 25

### **Instructions for Paper setter/ Candidates**

Laboratory examination will consist of two parts:

1. Performing a practical examination assigned by the examiner
2. Viva-voce examination

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester.

### **LIST OF EXPERIMENTS**

1. To verify KCL and KVL.
2. To study various types of Electrical Meters.
3. To perform open circuit and short circuit test of Transformer.
4. Measurement of power by Three Voltmeter/Three Ammeter method.
5. Measurement of power in 3-phase system by two wattmeter method.
6. To perform direct load test of transformer and plot efficiency v/s load characteristics.
7. To perform direct load test of the DC shunt generator and plot load v/s current curve.
8. To study frequency response of series RLC circuit and determine resonance frequency and Q factor for various values of R,L,C.
9. To study frequency response of parallel RLC circuit and determine resonance frequency and Q factor for various values of R,L,C.

**Note:** All the practicals of Electrical should also be performed on breadboard.

## **BASIC ELECTRONICS ENGINEERING LAB (BE– 101b(P))**

Course Code	<b>BE– 101b(P)</b>	Credits-2	L-0, T-0, P-2
Name of the Course	<b>Basic Electronics Engineering Lab.</b>		
Lectures to be Delivered	26 hours of Lab. work (2 hrs. per week)		
Semester End Examination	Max Marks: 25	Min Pass Marks: 10	Maximum Time: 3 hrs
Continuous Assessment	Lab work 30%, Lab Record 25% Viva/ Hands on 25% Attendance 20%	Max Marks: 25	

### **Instructions for Paper setter/ Candidates**

Laboratory examination will consist of two parts:

1. Performing a practical examination assigned by the examiner
2. Viva-voce examination

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester.

### **LIST OF EXPERIMENTS**

1. Familiarization with electronic components, and general purpose Laboratory equipment.
2. Use of CRO and function generator and calculation of amplitude, frequency, time period of different types of ac signals.
3. Verification of Junction Diode and Zener Diode characteristic and determination of static and dynamic resistance at the operating point
4. Verification of input and output characteristics of a Bipolar Junction Transistor and determination of the operating point on load line.
5. Verification of input and output characteristics of a Field Effect Transistor and determination of the operating point on load line.
6. Verification of Series and Parallel Resonance theory.
7. Operation of diode as different form of rectifier and effect of different types of passive filters on the output.
8. Determination of frequency response of a RC coupled amplifier and determination of bandwidth and signal handling capacity.
9. Use of OP-AMP as an inverting and non-inverting amplifier for different gains.
10. Verification of Uni-junction Transistor characteristics and relaxation oscillator
11. Rectifiers- Half wave , Full wave & Bridge rectifiers

**Note:** All the practicals should be performed on breadboard.

## WORKSHOP PRACTICE-II (WS-102)

<b>Course Code</b>	<b>WS- 102</b>	<b>L-0, T-0, P-3</b>
<b>Name of the Course</b>	<b>Workshop Practice -II</b>	
<b>Lectures to be delivered</b>	<b>39 hours of Lab sessions in each semester</b>	
<b>Semester End Examination</b>	<b>Max. Marks: 25</b>	<b>Min. Pass Marks: 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner .
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

#### **List of Experiments: -**

##### **Fitting Shop: -**

1. Drilling and Tapping in a M.S. piece.
2. To make a male-female joint (Taper type) of mild steel.

##### **Machine Shop: -**

1. To perform boring operation on lathe machine.
2. To perform knurling and threading operation on lathe machine.
3. Step turning operation on a lathe machine.

##### **Carpentry and Pattern making Shop: -**

1. To make a single piece pattern of connecting rod.
2. To make a self-cod pattern.
3. To make a split pattern.

##### **Welding Shop: -**

1. To make a V butt joint in horizontal position.
2. To make a V butt joint in vertical position.
3. To perform Gas welding operation.

##### **Smithy and Forging: -**

1. To make a cube from a circular bar.
2. To make a tong using hot forging operations.
3. To perform drawing down operation.

##### **Foundry Shop: -**

1. To make a mould and perform casting operation.
2. Study of casting defects and its remedies.

**Sheet Metal Working Shop: -**

Blanking and piercing die construction, press work materials, strip layout, bending dies, forming dies, drawing operations, single and double action draw dies.

1. To make a Ring by Piercing.
2. To make a square shaped object by Bending and Forming Operation.
3. To Draw a Wire.

**Suggested Reading: -**

1. Workshop Technology by Chapman
2. Manufacturing Processes by Begman
3. Manufacturing Materials and Processes by J. S. Campbell



**Semester -III**  
**ENGINEERING ECONOMICS (HS-201)**

Course Code	<b>HS-201</b>	L-3, T-0, P-0	
Name of the Course	<b>Engineering Economics</b>		
Lectures to be delivered	<b>39 (1 Hr Each) (L = 39 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b>	(based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		<b>Max. Marks: 50</b>

**INSTRUCTIONS:**

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

**Section-A**

**Economics:** Definition, nature and scope of economics, need & significance of economics in Engineering, Economic Systems- Meaning of capitalism, socialism and mixed economy

**Demand:** Meaning, determinants of demand, demand curve, law of demand, exception to the law of demand, increase & decrease in demand, contraction & extension of demand, Elasticity of demand, Methods of measuring Elasticity of demand

**Supply:** Law of supply, extension & contraction of supply, increase & decrease in Supply, Elasticity of supply

**Section-B**

**Cost of Production:** Concept, types, Relation between average & marginal cost.

**Theory of Production:** Laws of returns- Law of variable proportions and law of returns to Scale, Break Even Analysis.

**Price & Output Determination:** Price determination under perfect competition, monopoly, monopolistic competition & oligopoly.

**Section-C**

**Monetary policy-** Meaning, objectives, methods, Fiscal policy- Meaning & Objectives of fiscal policy In a developing country like India, Functions of Reserve Bank of India and commercial banks.

**Economics & Business Environment-** Business/Trade Cycles- Meaning, Characteristics & classification, Inflation Effect, Foreign capital & economic development, Engineering Economics Analysis, Economics Analysis in the public and regulated sectors.

### **Section D**

**Indian Economy:** - Characteristics of Indian economy, Planning in India, Development & Growth in India. Overall Economic policy since independence, Input & output analysis, Problem of unemployment in India. Concept of sustainable development & inclusive growth in India. Policy of globalizations, liberalisation & privatization. Analysis of state & union budgets.

#### **TEXT BOOKS:**

1. Modern Micro Economics by Koutsoyannisa, MC Millen
2. Principles of Engineering Economics Analysis by John A. White, Kenneth E. Case and David B. Pratt Wiley India

#### **REFERENCE BOOKS:**

1. Business Economics by K. P. M. Sundharam, Sultan Chand & Sons
2. Elementary Economics Theory by K.K Dewett & J. D. Verma, S.Chand Publication

## STRENGTH OF MATERIALS (CE-211)

Course Code	<b>CE-211</b>	L-3, T-1, P-0	
Name of the Course	<b>Strength of Materials</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, P = 13 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

- For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

#### Section-A

**Analysis of stresses:** Body forces, Surface forces, Internal Force, Stress at a point, Components of stress in rectangular coordinates, Stress tensor, Principal stresses, Transformation, Equations, Stress invariants, Plane stress, Mohr's circle for plane stress, Octahedral stresses, Differential equations of equilibrium, components of stresses in cylindrical and Polar coordinates.

**Analysis of Strain:** Deformable bodies, Concepts of normal strain and shear strain, Strain components at a point, Transformation equations, Principal strains, Mohr's circle of strains, Compatibility conditions, Displacement equation of equilibrium, Plane strain.

#### Section-B

**Theories of Failure:** Failure of Materials, Failure theories of ductile materials, Maximum principle stress criterion (Rankine, Lamé's), Maximum Principle strain Theory (St. Venant's), Maximum Strain Energy Theory (Beltrami-Haigh's), Maximum Shear Stress Theory (Tresca-Guest and Coulomb), Maximum Distortional Stress or Octahedral Shear Stress Theory (Von-Mises-Maxwell-Huber-Henkey's), Failure Theories of brittle materials (Mohr-Coulomb).

**Unsymmetric Bending and Shear Centre:** Bending about a principle axis, bending about arbitrary Axis, Shear Centre.

#### Section-C

**Slope and Deflection of Beams:** The moment curvature relation, Double integration method, Macaulay's method.

**Buckling of Columns:** Stable and unstable equilibrium, Critical load, Euler's Curves, Rankine's formula, Secant formula, Analysis of eccentrically and laterally loaded columns, Columns with initial curvature.

## Section-D

**Energy Principles:** Concept of Strain Energy, Strain Energy due to axial tension/compression, bending, shear and Torsion. Complementary strain Energy, Virtual Work Theorem, Total potential Energy theorem, Castiglaino's First Theorem, Complementary Virtual Work Theorem, Total complementary Potential energy Theorem, Castiglaino's Second Theorem, Maxwell Betti's Reciprocal Theorem.

**Combined Stresses:** Beam subjected to bending and shear, shaft subjected to bending and torsion,

### TEXT BOOKS:

1. Fundamentals of Strength of Materials, by Bebabrata Nag and Abhijit Chanda, Wiley India.
2. Strength of Materials, H C Hibbler, Pearson

### REFERENCE BOOKS:

1. Mechanics of Solids, by Abdul Mubeen, Pearson
2. Fundamentals of Solid Mechanics, by M L Gambhir, PHI Learning
3. Strength of Timoshenko, S.P. and. Young D.H., Elements of strength of materials, Affiliated East-West Press, New Delhi.
4. Strength of materials by Timoshenko, S.P., CBS Publisher, Delhi.
5. Mechanics of materials, by Popov,Egor Paul, Nagarakam,S, , Prentice-Hall.

## BUILDING CONSTRUCTION AND MATERIALS (CE-212)

Course Code	CE-212	L-03, T-01,P-0	
Name of Course	Building Construction and Materials		
Lectures to be delivered	52 (L-39, T-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks : 40	Time Allowed : 3 Hrs.
Continuous Assessment (based on sessional tests 50%)	Tutorial/Assignment: 30%, Quiz/Seminar: 10%, Attendance: 10%.		Max. Marks : 50

### INSTRUCTIONS:

- For Paper Setters:** The question paper will consist of five sections A,B,C,D & E. Section E will be compulsory; it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A,B,C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- For Candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E.

### SECTION-A

**BRICK & STONE MASONRY:** Various terms used, types, tools used, bonds in brick work, dressing of stones, applications for lifting stones.

**PARTITION AND CAVITY WALLS:** Types of non bearing partition-brick partitions, clay block partitions, timber partitions and glass partitions, construction of a masonry cavity walls.

**DAMP PREVENTION:** Sources of dampness, effects of dampness, prevention of dampness, materials used in damp proofing course.

**(10 Lect)**

### SECTIONS-B

**ROOFS:** Types terms used in sloping roof, king post truss, queen post truss, simple steel roof trusses.

**FLOORS:** Components of floor, brick floors, cement concrete floors, terrazzo flooring, mosaic floorings, tiled flooring.

**DOORS & WINDOWS:** Locations, sizes general types of door movement, various types of doors and windows.

**(9 Lect.)**

### SECTION-C

**STONES :** Stone as building material, criteria for selection, tests on stones, deterioration and preservation of stone work.

**BRICKS:** Classification, manufacture of clay bricks, test on bricks-compressive strength, water absorption, efflorescence. Bricks for special use-Refractory bricks, cement and concrete hollow blocks and lightweight concrete blocks.

**TILES, TERRA COTTA:** Manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra cotta.

**LIME, CEMENT AND MORTAR:** Preparation of lime mortar; cement ingredients-manufacturing process, types and grades, properties of cement and cement mortar-hydration, compressive strength, tensile strength, soundness and consistency and setting time.

**STEEL:** Types of steel, marketable forms, stress-strain behavior.

**(9 Lect.)**

#### **SECTION-D**

**CONCRETE:** Ingredients, manufacture, batching plants, properties of fresh concrete-slump, flow and compaction; principles of hardened concrete-compressive, tensile and shear strength, modulus of rupture; tests-mix specification, mix proportioning, IS method, high strength concrete and HPC, other types of concrete.

**TIMBER:** Market forms, industrial timber-plywood-veneer-thermocole-panels of laminates.

**PAINTS AND VARNISHES:** Constituents of paints, types of paints, types, constituents and characteristics of varnishes.

**INTRODUCTION TO POLYMERS:** Polymetric materials, PVC, Polyester, HDPE, CDPE, ceramics, fibre glass and their applications in civil engineering.

**(10 Lect.)**

#### **TEXT BOOKS:**

1. Building Construction by Sharma & Kaul,
2. Engineering Materials by Surinder Singh,

#### **REFERENCE BOOKS:**

1. Properties of concrete by A M Naville, PEARSON
2. Construction Technology Analysis and Choice by Tony Bryan Wiley India
3. Civil Engineering Materials by Shan Somayaji, Pearson
4. Concrete Technology by A.M. Naville, PEARSON
5. Concrete Technology by A.M. Santhakumar, Oxford
6. Building Construction by B.C. Punmia
7. Building Construction, Sushil Kumar
8. Building Construction, Gurcharan Singh, Standard Pub., N.Delhi

## FLUID MECHANICS (CE – 213)

Course Code	CE-213	L-03, T-01, P-0	
Name of Course	FLUID MECHANICS		
Lectures to be delivered	52 (L-39, T-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**INTRODUCTION:** Definition, units, properties of fluids, Newtonian and non Newtonian fluids.  
**FLUID STATICS:** Basic equations, pressure, pressure measurement, stability of floating bodies, pressure diagram, hydrostatic forces on submerged bodies, buoyancy and floatation. **(10 Lect)**

### SECTION – B

**FLUID KINEMATICS:** Flow characteristics, continuity equation, acceleration of fluid particles, Continuity Equation, rotational and irrotational motion, circulation and vorticity, velocity potential and stream function, streamlines, equipotential lines, flow net - method, uses of flow net.

**FLUID DYNAMICS:** Euler's equation, Bernoulli's equation, application of Bernoulli's equation-orificemeter, venturimeter, pitot tube etc., flow through orifice, mouthpiece, weir and notches, impulse momentum equation and its application to pipe junction, bends, stationary flat and curved vanes moment of momentum equation. **(10 Lect)**

### SECTION – C

**FLOW THROUGH PIPES:** Reynolds' experiment, energy losses, laws of fluid friction, Darcy-Weisbach equation, equivalent pipe, pipes in series and parallel, branched pipes, pipe networks.

**LAMINAR FLOW AND TURBULENT FLOW:** Laminar flow through circular pipes, parallel plates, Stokes law, measurement of viscosity, transition from laminar to turbulent flow. **(9 Lect)**

## **SECTION – D**

**DIMENSIONAL ANALYSIS AND SIMILITUDE:** Dimensional homogeneity, methods of dimensional analysis, model analysis, similitude – types of similarities, force ratios, similarity laws, model classification, scale effects.

**BOUNDARY LAYER THEORY:** Types, boundary layer thickness and equations, momentum integral equation boundary layer on rough surfaces, total drag on flat plate due to laminar and turbulent boundary layer, boundary layer separation and its control. **(10 Lect )**

### **TEXT BOOKS:**

1. Fluid Mechanics by Dr A. K. Jain,
2. Hydraulics and Fluid Mechanics : P.N. Modi and S. M. Seth,

### **REFERENCE BOOKS:**

1. Fluid Mechanics : F. M. White,
2. Fluid Mechanics : Wiley and Streeter ,
3. Introduction to Fluid Mechanics, by Fox, Pritchard and McDonald, Wiley
4. Fundamental of Fluid Mechanics by Munson, Young, Okiishi and Huebsch, Wiley
5. Introduction to Fluid Mechanics by Edward J Shaughnessy, Ira M Katz and James P Schaffer, Oxford



## SURVEYING - I (CE – 214)

Course Code	CE-214	L-03, T-01, P-0	
Name of Course	SURVEYING - I		
Lectures to be delivered	52 (L-39, T-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**INTRODUCTION:** Introduction, history of surveying, definition of surveying, primary divisions of surveying, object and classification of surveying, principles of surveying, units of measurement, representation of scale, duties of surveyor, office work of a surveyor, care and adjustments of instruments, accuracy & precision, sources of errors, types of errors, degree of accuracy, order of accuracy.

**MEASUREMENT OF DISTANCES:** Introduction, approximate methods, surveying chains & tapes, unfolding and folding of a chain, steel bands, instruments for chaining & taping, measurement by tape & chain, errors in tape measurements and their corrections, chain corrections, testing and adjusting of a chain, chaining on flat and sloping ground, obstacle in chaining, direct & indirect methods of ranging, modern trends. (10 Lect)

### SECTION – B

**COMPASS & CHAIN TRAVERSING:** Methods of traversing, principles, basic definitions, bearings & meridians, prismatic compass, surveyors compass, azimuthal & quadrantal bearing systems, true north & magnetic north, magnetic declination, local attraction and its correction.

**THEODOLITE & THEODOLITE TRAVERSING:** Vernier theodolite, microscopic theodolite, construction, temporary & permanent adjustments, measurements of horizontal & vertical angles, methods of repetitions & reiteration, sources of errors, checks in traversing, adjustments of traverse, degree of accuracy, omitted measurements. (10 Lect)

### SECTION – C

**LEVELLING:** Definitions of terms, principles of leveling i.e spirit, trigonometric, barometric, types of levels, methods of spirit leveling, leveling staffs, booking & reduction in field book, balancing of sights, errors-curvature & refraction, distance of visible horizon, reciprocal leveling & its merits, sensitivity of bubble tube.

**CONTOURING:** Methods of relief representations, contour, contour interval, horizontal equivalent, contour gradient, factors affecting contour interval, characteristics of contours, direct & indirect methods of contouring, uses of contour maps. **(9 Lect)**

#### **SECTION – D**

**AREA, VOLUME AND MINOR INSTRUMENTS:** Methods of computation of areas from field notes and plan, construction and use of planimeter, volume computations from-section, earthwork, prismatic and curvature corrections, capacity of reservoir, volume of borrowpits, hand level, abney level box sextant, site square, pantagraph, ceylonghat tracer, Indian pattern clinometers

**PLANE TABLE SURVEYING:** Principles, merits & demerits instruments and other accessories, methods used, radiation, traversing, resection, intersection and their uses. Two and three point problems, uses of tangent clinometers.

**TACHEOMETRY:** Definitions, general principles of stadia system, fixed and movable hair methods, inclined sights with staff vertical, inclined sight with staff normal to the line of sight. Determination of tacheometric constants, analytic lens, field work and seconds, tangential system, subtense bar method, auto reduction tacheometer. **(10 Lect)**

#### **TEXT BOOKS:**

1. Surveying Volume – I and II by B C Punmia, Lakshmi Publication
2. Surveying Volume – I and II by K R Arora,

#### **REFERENCE BOOKS:**

1. Engineering Survey by W. Schofield
2. Advance Surveying by R Agor
3. Advanced Surveying by Satheesh Gopi, R Sathikumar and N Madhu by Pearson
4. Surveying, Vol. I, S.K. Duggal, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi
5. Surveying and Levelling, T.P. Kanetker and Kulkarni, Pune Vidyarthi Gruha Prakashan
6. Surveying for Engineers by J.Uren and W.F.Price, The Macmillan Press Ltd., London.
7. Surveying Principles and Applications by B.F.Kavanagh and D.J.G. Bird, prentice Hall, Englewood Cliffs, New Jersey.
8. Surveying and Levellings by N. N. Basaak, Tata Mc Graw Hill Publishing Co. Ltd

## ENGINEERING MATHEMATICS-III (NS-206)

Course Code	NS-206	L-03, T-01, P-0	
Name of Course	Engineering Mathematics-III		
Lectures to be delivered	52 (L-39, T-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### Section-A

#### 1. PARTIAL DIFFERENTIAL EQUATIONS

Formation and solutions of partial differential equations, Lagrange's linear equation of the first order, non linear equations of first order, charpit method, Homogenous linear partial differential equation with constant coefficients, rules for complementary function and particular integral, non-homogenous linear partial differential equations, Method of separation of variables, Solution of wave equations, Heat flow equations, Laplace's equations and their applications to engineering problems.

### Section-B

#### 2. SPECIAL FUNCTIONS:

Power series solution of differential equations, Frobenius method, Bessel's equation, Bessel functions of the first and second kind, Recurrence relations of Bessel functions, Generating functions, Orthogonality of Bessel functions, Legendre's equation, Legendre polynomial, Recurrence relations of Legendre's functions, Rodrigue's formula, Orthogonality of Legendre polynomials, Error function and its properties.

### Section-C

#### 3. INTEGRAL TRANSFORMS

Laplace Transforms of standard functions and their properties, Inverse Laplace Transforms, General Properties of inverse Laplace transforms and Convolution Theorem, Laplace Transforms of periodic functions, Laplace transform of Bessel functions and Error function, Dirac-delta Function, Heaviside's Unit Function, Applications to linear simultaneous differential equations. Fourier Integral, Fourier Transform, Fourier sine and cosine transforms, finite Fourier transform, Convolution theorem for Fourier Transform and Parseval's Identity for Fourier Transform.

## Section-D

### 4. FUNCTIONS OF COMPLEX VARIABLE

Limit and derivative of complex functions, Cauchy-Riemann equations, Analytic functions, Entire functions and its applications, Conformal mapping and standard transformations, Complex integration, Cauchy's theorem and Cauchy's integral formula (without proof), Series of complex terms, Taylor's series and Laurent's series (without proof), Zeros of analytic functions, isolated singularity, removable singularity, Poles, essential singularity, Residue, Residue theorem and their applications

#### TEXT BOOKS

1. Advanced Engineering Mathematics: by Erwin Kreyszig . John Wiley and Sons, NC, New York.
2. Partial Differential Equation for Engineers and Scientists: by J.N. Sharma and Kehar Singh Narosa Publishing House, New Delhi/ Alpha Science Int. Ltd, UK.
3. Advanced Engineering Mathematics: by R. K. Jain & S. R. K Iyengar, Narosa Pub. House.
4. Complex Variables Theory and Applications: by HS Kasana, PHI Learning Private Limited New Delhi, (2008).

#### REFERENCE BOOKS

1. Advanced Engineering Mathematics: by C. R. Wylie & L. C. Barrett, McGraw Hill.
2. Elements of Partial Differential Equations: by Ian N. Sneddon, McGraw-Hill, Singapore.
3. Differential & Integral Calculus: by N. Piskunov, MIR Publications.
4. Calculus and Analytic Geometry, by Thomes, G.B, Finney, R.L. Ninth Edition, Peason Education.
5. Advanced Engineering Mathematics, by Peter. V. O. Nil, Wordsworth Publishing Company.
6. Advanced Engineering Mathematics, by Jain, R.K and Lyengar, S.R.K., Narosa Publishing Company.
7. Higher Engineering Mathematics, by Grewal, B.S., Khanna Publishers, New Delhi.
8. Engineering Mathematics, by Taneja, H.C., Volume-I & Volume-II, I.K. Publisher.
9. Differential Equations: by Shepley L. Ross, John Wiley & Sons, New York.

### BUILDING MATERIAL LAB CE-212 (P)

Course Code	CE-212(P)	L-0, T-0,P-2
Name of Course	Building Material Lab	
Lectures to be delivered	26 (P-26, for each semester)	
Semester End Examination	MM: 25	Min. Marks : 10
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%	Max. Marks : 25

#### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination.  
Vive-voce examination will be related to the practicals performed/project executed by the candidate related to the paper during the course of the semester.

#### LIST OF EXPERIMENTS

Sr. No.	Title of the Experiment
	<b>A. Stone &amp; Bricks</b>
1	To identify the various types of stones and their applications.
2	To identify the various bricks and their applications.
3	To conduct the field test on bricks viz hardness, shape and size, soundness, colour and strength.
4	To determine the amount of water absorbed by the bricks.
5	To determine the crushing strength of bricks using compressive testing machine.
	<b>B. Cement</b>
6	To determine the fineness of cement by sieve method.
7	To determine the normal consistency of cement paste.
8	To determine the initial and final setting times of cement.
	<b>C. Aggregates</b>
9	To determine the percentage bulking of sand in moist condition.
10	To determine the specific gravity of fine and coarse aggregates.
	<b>D. Metals</b>
11	To conduct the tension test on the given mild steel specimen to determine yield, strength, ultimate strength, breaking strength, percentage, elongation and young's modulus.

### FLUID MECHANICS LAB CE-213(P)

<b>Course Code</b>	<b>CE-213(P)</b>	<b>L-0, T-0, P-2</b>
<b>Name of Course</b>	<b>Fluid Mechanics Lab</b>	
<b>Lectures to be delivered</b>	<b>26 (P-26, for each semester)</b>	
<b>Semester End Examination</b>	<b>MM: 25</b>	<b>Min. Marks- 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

#### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

#### LIST OF EXPERIMENTS:

1. To determine the metacentric height of a ship model.
2. Verification of Bernoulli's theorem.
3. To calibrate a venturimeter and to determine its coefficient of discharge
4. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number
5. To study the flow over V- notch (weir) and Rectangular notch and to find their coefficient of discharge
6. To determine the coefficient of discharge of a mouth piece.
7. To verify the momentum equation experimentally.
8. To determine the coefficient of friction of pipes of different diameters.
9. To determine the form losses in a pipe line.
10. To obtain the surface profile on the total heads distribution of a forced vortex

### SURVEYING LAB-I CE-214(P)

<b>Course Code</b>	<b>CE-214(P)</b>	<b>L-0, T-0, P-2</b>
<b>Name of Course</b>	<b>Surveying Lab-I</b>	
<b>Lectures to be delivered</b>	<b>26 (P-26, for each semester)</b>	
<b>Semester End Examination</b>	<b>MM: 25</b>	<b>Min. Marks- 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

#### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

#### LIST OF EXPERIMENTS:

1. To determine the difference in elevation of two given points.
2. Profile levelling and cross sectioning of a given route.
3. To measure the horizontal angle by the method of reiteration and repetition, theodolite traversing and error adjustment.
4. To prepare the contour map of an area by the method of radial lines.
5. Determination of elevation of top of tower using theodolite
6. Plane tabling by the method of radiation and intersection.
7. Solution of Three point problem in plane tabling
8. Setting out of simple circular curve by one theodolite and by two theodolite method.

## BUILDING DRAWING CE-215(P)

<b>Course Code</b>	<b>CE-215(P)</b>	<b>L-0, T-0, P-2</b>
<b>Name of Course</b>	<b>Building Drawing</b>	
<b>Lectures to be delivered</b>	<b>26 (P-26, for each semester)</b>	
<b>Semester End Examination</b>	<b>MM: 25</b>	<b>Min. Marks- 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

### INSTRUCTIONS:

End semester Examination will consist of Viva-voce examination related to the drawing sheets prepared by the candidate related to the paper during the course of the semester.

### OBJECTIVE:

The student is expected to know local building rules and national building code provisions. At the end of this course the student should be able to draft building drawings (Plan, elevation and sectional views) in accordance with development and control rules satisfying orientation and functional requirements for the following:

### SYLLABUS:

Working drawings for

1. Residential buildings: Flat and pitched roof – cottages, bungalows and flats (single storied and double storied) (4 sheets)
2. Public buildings – schools, offices, libraries, restaurants, commercial complexes (3sheets)
3. Industrial buildings – North light roof structures – Trusses (2 Sheets)
4. Preparation of site plan and plan as per building rules. (2 sheets)
5. Plumbing: water supply and sanitary drawings for residential buildings. (1 sheet)

### TEXT BOOKS

1. Civil Engg. Drawing & House Planning – Varma B. P., Khanna publishers, Delhi
2. Building drawing & detailing – Balagopal & T. S. Prabhu, Spades Publishers, Calicut.

### REFERENCE BOOKS

1. Building drawing – Shah. M. G., Tata McGraw-Hill
2. Building planning & Drawing –Kumaraswamy N., Kameswara Rao A., Charotar Publishing
3. Shah, Kale and Patki, Building Drawing with integrated approach to built environment, Tata McGraw-Hill.
4. B. P. Varma, Civil Engineering drawing and House Planning, Khanna Publishers, Delhi.
5. Gurucharan Singh, Subhash Chander Sharma, Civil Engineering drawing, Standard Publishers distributors, Delhi.
6. National Building code, Local building byelaws.



**Semester –4<sup>th</sup>**  
**HUMAN VALUES AND PROFESSIONAL ETHICS-III (HS-203)**

<b>Course Code</b>	<b>HS-203</b>	<b>L-02, T-01, P-02</b>	
<b>Name of Course</b>	<b>Human Values and Professional Ethics</b>		
<b>Lectures to be delivered</b>	<b>52 (L-26, P-26 for each semester)</b>		
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>
<b>Continuous Assessment (based on sessional tests 50%) Tutorial/Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			<b>MM: 50.</b>

**INSTRUCTIONS:**

1. **For Paper Setters:** The question paper will consist of six sections A, B, C, D, E & F. Section F will be compulsory, it will consist of a single question with 10-15 subparts of short answer type, which will cover the entire syllabus. Section A, B, C, D & E will have two questions from the respective sections of the syllabus. Each section will have a weightage of 15% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt six questions in all selecting one question from each of the sections A, B, C, D & E of the question paper and all the subparts of the questions in Section E.

**OBJECTIVES:**

- a. 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.
- b. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- c. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Thus, this course is intended to provide a much needed orientation input in Value Education to the young enquiring minds.

**COURSE METHODOLOGY:**

- The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence.
- It is free from any dogma or value prescriptions.
- It is a process of self-investigation and self-exploration, and not of giving sermons.
- Whatever is found as truth or reality is stated as proposal and the students are facilitated to verify it in their own right based on their Natural Acceptance and Experiential Validation.
- This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and within the student himself/herself finally.
- This self-exploration also enables them to evaluate their pre-conditionings and present beliefs.

## Content

### **SECTION A: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in **harmony** at various levels

### **SECTION B: Understanding Harmony in the Human Being - Harmony in Myself!**

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
8. Understanding the needs of Self (‘I’) and ‘Body’ - *Sukh* and *Suvidha*
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
11. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure *Sanyam* and *Swasthya* - Practice Exercises and Case Studies will be taken up in Practice Sessions.

### **SECTION C: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

13. Understanding harmony in the Family- the basic unit of human interaction
14. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;  
Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
15. Understanding the meaning of *Vishwas*; Difference between intention and competence
16. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals
18. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj*), Universal Order (*Sarvabhaum Vyawastha* )- from family to world family!  
- Practice Exercises and Case Studies will be taken up in Practice Sessions.

### **SECTION D: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

19. Understanding the harmony in the Nature
20. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature
21. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
22. Holistic perception of harmony at all levels of existence- Practice Exercises and Case Studies will be taken up in Practice Sessions.

## **SECTION E: Implications of the above Holistic Understanding of Harmony on Professional Ethics**

23. Natural acceptance of human values
24. Definitiveness of Ethical Human Conduct
25. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26. Competence in professional ethics:
  - a) Ability to utilize the professional competence for augmenting universal human order,
  - b) Ability to identify the scope and characteristics of people-friendly and ecofriendly production systems,
  - c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
27. Case studies of typical holistic technologies, management models and production systems
28. Strategy for transition from the present state to Universal Human Order:
  - a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
  - b) At the level of society: as mutually enriching institutions and organizations

### **TEXT BOOK:**

1. R R Gaur, R Sangal, G P Bhagaria, 2009, *A Foundation Course in Value Education*.

### **REFERENCE BOOKS:**

1. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
3. A Nagraj, 1998, *Jeevan Vidya ek Parichay*, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991
5. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
6. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.
7. Subhas Palekar, 2000, *How to practice Natural Farming*, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth – Club of Rome’s report*, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, *Fundamentals of Ethics for Scientists & Engineers*, Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, *Engineering Ethics (including Human Values)*, Eastern Economy Edition, Prentice Hall of India Ltd.
11. Values and Ethics in Business & Professional, Samita Manna & Suparna Chakraborti, PHI Learning Private Limited.

### **RELEVANT CDS, MOVIES, DOCUMENTARIES & OTHER LITERATURE:**

1. Value Education website, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology – the Untold Story*

## NUMERICAL METHODS FOR ENGINEERS (NS-207)

Course Code	NS-207	L-03, T-01, P-0	
Name of Course	Numerical Methods for Engineers		
Lectures to be delivered	52 (L-39, P-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:** Bisection method, Method of false position, secant method, Iteration method, Newton-Raphson method and Generalized Newton-Raphson method, Rate of convergence and condition of convergence, solution of simultaneous equations by Iteration method and Newton-Raphson method

**SOLUTION OF SIMULTANEOUS ALGEBRAIC EQUATIONS:** Partial and Complete Pivoting, Gauss Elimination method, Gauss Jordan method, Jacobi's method, Gauss-Seidal method, Relaxation method and LU-decomposition method.

### SECTION-B

**FINITE DIFFERENCE AND INTERPOLATION:** Errors and approximation analysis, Interpolation, Various difference operators and relation between them, Newton's forward and backward interpolation formulae, Central difference Interpolation formula, Gauss's forward and backward interpolation formulae, Stirling formula, Bessel formula, Lagrange's interpolation formula of unequal intervals, Newton's divided difference formulae.

### SECTION-C

**NUMERICAL DIFFERENTIATION AND INTEGRATION:** Numerical differentiation: Derivatives using Newton forward, backward and central difference formulas, Derivatives using Gauss forward and backward formulas, Derivatives using Bessel formula, Derivatives using Newton divided difference formulas, Maxima and minima of tabulated functions.

**NUMERICAL INTEGRATION:** Newton-Cotes Quadrature formula, Trapezoidal rule, Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rules, Boole's and Weddle's rules, Errors and accuracy of these formulae (Trapezoidal rule, Simpson's  $1/3^{\text{rd}}$  rule) Romberg's integration.

#### **SECTION-D**

**NUMERICAL SOLUTIONS OF ORDINARY EQUATIONS:** Picard method, Taylor's series method, Euler's method, Runge's method, Runge-Kutta method, Predictor- Corrector Methods: Milne's method and Adams-Bashforth method.

**NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL:** Finite difference approximations of partial derivatives, solution of Laplace equation (Standard five-point formula and Diagonal five-point formula), Solution of Poisson equation.

#### **TEXT BOOKS:**

1. Numerical methods for Scientific & Engg. Computations: M. K. Jain, S. R. K. Iyengar & R. K. Jain; Wiley Eastern Ltd.
2. Introductory Methods of Numerical Analysis Engineers & Sciences: S. S. Sastry, PHI Learning Private Limited New Delhi, (2009).

#### **REFERENCE BOOKS:**

1. Numerical Methods in Engineers & Sciences : J.N Sharma : Narosa Publishers.
2. Numerical Methods in Engg. & Sciences : B.S.Grewal : Khanna Publishers.
3. Computer Oriented Numerical methods: U. Rajaraman Orebtuce; Hall of India.
4. Introduction to Numerical Analysis: C. E. Froberg; Addison Wesley.

## STRUCTURAL ANALYSIS-I (CE-221)

Course Code	CE-221	L-03, T-01, P-0	
Name of Course	Structural Analysis-I		
Lectures to be delivered	52 (L-39, P-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**Fundamentals** - Classification of Structure, Types of Load, Response/ behavior of structure, Principle of superposition, Equations of Equilibrium, Determinacy (Static and Kinematic) and stability.

**Force Response in Statically Determinate Structures** – Review of support Reactions, Internal Forces in Beams and Axial Forces in Trusses. Axial Forces in Cables subjected to concentrated loads and full or partial uniformly distributed loads. Concept Funicular Arches and internal forces in three hinged arches, Internal Forces in Frames,

### SECTION - B

**Influence Lines** – Influence line diagrams for beams, Muller Breslau's Principle for qualitative influence lines, Influence lines for floor girders, Influence line diagrams for Trusses, Maximum influence at a point due to single concentrated rolling load, pair of rolling loads, series of rolling loads and uniformly distributed moving loads, Absolute maximum shears and moments.

### SECTION- C

**Displacement Response in Statically Determinate Structures** - Deflection in Beams using Energy Methods, Moment-Area method, Conjugate Beam method, Principle of Virtual work, method of virtual work for trusses, method of virtual work for beams and frames, Castigliano's theorem for trusses, beams and frames, unit load method.

## **SECTION - D**

**Approximate analysis of Statically Indeterminate Structures:** Vertical loads on building frames, Lateral loads on building frames, portal method and Cantilever method.

### **TEXT BOOKS:**

1. Structural analysis by Menon, Devdas, Narosa Publishing House, New Delhi.
2. Structural Analysis by Hibbeler, R.C., Pearson Education Asia publication, Delhi.

### **REFERENCE BOOKS:**

1. Fundamentals of Structural Analysis by Harry H West and Louis F Geschwindner, Wiley India.
2. Theory of structures, by Punmia, B.C., Laxmi Publications, New Delhi
3. Analysis of Structures, Vazirani, V.N. and Ratwani, M.M., Khanna Publishers, New Delhi.
4. Analysis of Statically Determinate Structures by P. Dayaratnam,
5. Basic Structural Analysis, C. S. Reddy,
6. Elementary Structural Analysis by Willbur J.B. & C.H.Norris & Utku , Mc Graw Hill Book

## GEOTECHNICAL ENGINEERING-I (CE-222)

Course Code	CE-222	L-03, T-01, P-0	
Name of Course	Geotechnical Engineering-I		
Lectures to be delivered	52 (L-39, P-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**INTRODUCTION:** Definition of soil, rock, soil mechanics and foundation engineering, soil formation, soil structure, soil map of India.

**SOIL PROPERTIES :** Basic definitions, phase diagram, water content, specific gravity, void ratio, porosity, unit weight, weight volume relationships, index properties of soil and their determination, classification of soils, degree of saturation, density index.

### SECTION – B

**PERMEABILITY AND SEEPAGE :** Darcy's law and its validity, seepage velocity, discharge velocity, constant and variable head permea-meter, pumping in and out tests, permeability of stratified soils, factors affecting permeability, laplace's equation, flow potential flow net and its properties, different methods of drawing flownets, seepage pressure, quick sand, exit gradient, piping, design of filter, principle of total and effective stresses, capillarity conditions in soil, effective and pore pressures.

**STRESSES IN SOILS :** Need for finding stress distribution in soil, assumptions in elastic theories, Boussinesq's equation for point, line, circular and rectangular loads, Westergaad's formula for point load, comparison of Boussinesq's and Westergaad's equation, concept and use of pressure bulbs, principle and use of New mark's influence chart, contact pressure.

### SECTION – C

**COMPACTION :** Mechanism of compaction, objective of compaction, measurement of compaction, factors affecting compaction, optimum moisture content, Standarad Proctor test, Modified Proctor test, effect of moisture content and compactive effort on dry density, zero air void curve, compaction of cohesionless soils, field compaction, field control of compaction.

**CONSOLIDATION:** Mechanism of consolidation, e-logp curves, basic definitions, estimation of preconsolidation pressure, normally consolidation and over consolidation ratio, Terzaghi's



theory of one dimensional consolidation, assumptions, governing equation, standard solution, laboratory determination of consolidation properties of soil, magnitude and rate of consolidation, settlements, secondary consolidation, compression characteristics of clays and settlement analysis.

#### **SECTION – D**

**SHEAR STRENGTH :** Normal, shear and principal stresses, Coloumb's equation, Mohr's stress circle, Mohr-Coloumb failure criteria, laboratory determination of shear parameters of soil by direct shear tests, triaxial test, unconfined compression test, Vane shear test, Consolidated drained, consolidated undrained and unconsolidated undrained shear test, pore pressure parameters, Lambe's p-q diagram.

**SOIL STABILIZATION:** Mechanical stabilization, cement stabilization, lime stabilization, Chemical, bitumen, stabilization by heating, electrical stabilization and sand columns.

#### **TEXT BOOKS:**

1. Soil Mechanics and Foundation Engineering by B.C. Punmia, Laxmi Publications, New Delhi
2. Principles of soil mechanics by Scott, Ronald F., Addison-Wesley, Massachusetts .

#### **REFERENCE BOOKS:**

1. Soil Mechanics by T William Lambe and Robert V Whiteman, Wiley India
2. Soil Mechanics and Foundation Engineering by P Purushothama Raj, Pearson.
3. Geotechnical Engineering, by Venkatramaiah, C., New Age International Publishers, New Delhi.
4. Barnes, Graham, Soil mechanics: principles and practice, Palgrave Macmillan, New York.
5. Textbook of Geotechnical Engineering, 3<sup>rd</sup> Edition by I.H. Khan, PHI Learning Private Limited.

## HYDROPOWER AND FLUID MACHINES (CE – 223)

Course Code	CE-223	L-03, T-01, P-0	
Name of Course	Hydropower and Fluid Machines		
Lectures to be delivered	52 (L-39, P-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**Hydro Power Development:** Sources of energy and their comparative study, investigations and studies for hydropower development, estimation of available water power, flow and power duration curves, firm power and secondary power, plant capacity, installed capacity, constraints in hydropower development, operation and maintenance of hydropower plants. Classification of hydro-power plants based on storage characteristics, operating head, load, capacity.

### SECTION – B

Principal components of hydro-electric scheme. Storage and pondage, economic analysis of storage capacity, aspects of cost allocation for different purposes, reservoir operation using flow duration and flow mass curves. Types of power houses, various components. Reservoir sedimentation, trap efficiency, life of a reservoir, principle of desilting, design of desilting basins. Allignment and location of various types of intakes, trashracks, design of intake structures. Conveyance channels and tunnels, water hammer, surge tanks, penstocks classification and layout, hydraulic valves and gates, tail race channels.

### SECTION – C

**IMPACT OF JET AND JET PROPULSION:** Jet force on stationary plate- vertical, inclined, curved, hinged, Jet force on vanes including curved vanes, Jet propulsion.

**TURBINES:** Classification, theory of impulse turbines, turbines parameters, draft tube, specific speed, unit quantities and characteristic curves, vector diagram, governing of turbines, cavitations, selection.

## **SECTION – D**

**CENTRIFUGAL PUMPS:** Description, classification, velocity diagram, minimum starting speed, specific speed and characteristic curves, priming, cavitations.

**RECIPROCATING PUMPS:** Classification, indicator diagram, working, slip, acceleration effect of piston, indicator diagram, air vessels.

### **TEXT BOOKS:**

1. Modi, P. N., and Seth, S. M., Hydraulics, Fluid Mechanics and Hydraulic Machines, Standard Book Home, New Delhi, 2005.
2. Rajput, R. K., Text Book of Fluid Mechanics and Hydraulic Machinery, S. Chand & Company, Ltd., New Delhi, 2005.

### **REFERENCE BOOKS:**

1. Fluid Mechanics and Machinery by C S P Ojha, R Berndtsson, and P N Chandramouli, Oxford University Press.
2. Hydro electrical Engineering by Creager and Justin, J Wiley and Sons.
3. Water Power Engineering by H K Barrows, McGraw Hill Publishing.

## SURVEYING - II (CE – 224)

Course Code	CE-224	L-03, T-01, P-0	
Name of Course	Surveying-II		
Lectures to be delivered	52 (L-39, P-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**Curves:** Types of curves, elements of curve, different methods of setting out simple circular curves, compound curve, reverse curve, transition curve, types of transition curves, super-elevation, suitability of a circular curve, vertical curve.

**Theory of Errors:** Introduction, Definitions, laws of weights, Probable errors, Most probable value, Normal equations, method of least square, triangle, station adjustment, figure adjustment, Quadrilateral and Polygon adjustment of closed traverse and level nets.

### SECTION - B

**Triangulation:** Principle, classification of triangulation system, operation in triangulation survey, reconnaissance, selection of site for base line, its measurement and extension, correction to base line measurement, selection of stations, orders or triangulation figures, scaffolds and signals, marking of stations, intervisibility, strength of figures, reduction to center, derivation of relations when observations are taken from the satellite station and towards the station.

### SECTION – C

**Trigonometrical Levelling:** Introduction, determination of the level of the top of an object when its base is accessible and not accessible, Determination of height of object when two instrument stations are not in the same vertical plane, indirect levelling on a rough terrain, indirect levelling on a slopes, Effect of refraction and curvature, axis signal correction, Difference in elevation in single observation, Difference in elevations by reciprocal observation.

## SECTION – D

**Photogrammetry:** Basic concepts, type of photographs, Geometry of aerial photographs, scale of a vertical aerial photograph, Relief and tilt displacement, Ground control, preparation of mosaics, Stereoscopy, measurement of parallax and height determination, Stereoscopic plotting instruments.

**Field Astronomy:** Introduction, Definitions, solution of an astronomical triangle, coordinate systems time solar, Sidereal and standard equation of time, Conversion of time, sun dial, determination of time, azimuth, latitude and longitude, correction for astronomical observations, uses of astronomy in civil engineering.

### TEXT BOOKS:

1. Surveying Volume – I and II by B C Punmia, Lakshmi Publication
2. Surveying Volume – I and II by K R Arora,

### REFERENCE BOOKS:

1. Engineering Survey by W. Schofield
2. Advance Surveying by R Agor
3. Advanced Surveying by Satheesh Gopi, R Sathikumar and N Madhu by Pearson
4. Surveying, Vol. I, S.K. Duggal, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi
5. Surveying and Levelling, T.P. Kanetker and Kulkarni, PuneVidyarthi Gruha Prakashan
6. Surveying for Engineers by J.Uren and W.F.Price, The Macmillan Press Ltd., London.
7. Surveying Principles and Applications by B.F.Kavanagh and D.J.G. Bird, prentice Hall, Englewood Cliffs, New Jersey.
8. Surveying and Levelling by N. N. Basaak, Tata Mc Graw Hill Publishing Co. Ltd

## COMMUNICATION & PROFESSIONAL SKILLS LAB-II (HS-202(P))

<b>Course Code</b>	<b>HS-202 (P)</b>	<b>L-0, T-0, P-2</b>		
<b>Lectures to be Delivered</b>	<b>26 hours of Lab. work (2 hrs. per week)</b>			
<b>Semester</b>	<b>End</b>	<b>Max Marks: 50</b>	<b>Min Pass Marks: 20</b>	<b>Maximum Time: 3 hrs</b>
<b>Examination</b>	<b>Continuous Assessment</b>	<b>Lab work 30%</b>	<b>Lab Record 25%</b>	<b>Max Marks: 50</b>
		<b>Viva/ Hands on 25%</b>	<b>Attendance 20%</b>	

### **Instructions for paper setter / candidates:**

Laboratory examination will consist of two parts:

- (iii) Performing a practical exercises assigned by the examiner (25 marks).
- (iv) Viva-voce examination (25 marks)

Note: Each practical should be performed twice for effectiveness.

### **List of Practicals:**

1. Phonetics: Organs of speech, speech sounds, symbols, articulation of speech sounds- stress and intonation.
2. SWOT analysis (Personal / Organisation)
3. Group discussion
4. Debate
5. Vocabulary improvement programs
6. Technical write up based on critical thinking (On subject allocated by coordinator)
7. Telephonic etiquettes: Preparing, Controlling and Follow up.

### **RECOMMENDED BOOKS:**

1. Developing Communication Skills: by Krishan Mohan & Meera Bannerji
2. Group Discussions by Sudha Publications And Ramesh Publishing House, New Delhi
3. Vocabulary Improvement: Words Made Easy: by Diana Bonet
4. Word Power Made Easy: by Norman Lewis

## SOIL MECHANICS LAB - CE-222(P)

<b>Course Code</b>	<b>CE-222(P)</b>	<b>L-0, T-0, P-2</b>	
<b>Name of the Course</b>	<b>Soil Mechanics Lab</b>		
<b>Lectures to be delivered</b>	<b>26 hours of Lab sessions in each semester</b>		
<b>Semester End Examination</b>	<b>Max. Marks: 25</b>		<b>Min. Pass Marks: 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>		<b>Max. Marks: 25</b>

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner .
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

### List of Experiments: -

1. Visual Soil Classification and water content determination.
2. Determination of specific gravity of soil solids.
3. Grain size analysis-sieve analysis.
4. Liquid limit and plastic limit determination.
5. Field density by:
  - i) Sand replacement method
  - ii) Core cutter method
6. Proctor`s compaction test.
7. Coefficient of permeability of soils.
8. Unconfined compressive strength test.
9. Direct shear test on granular soil sample.
10. Unconsolidated undrained(UU) triaxial shear test of fine grained soil sample.

### REFERENCE BOOKS:

1. Soil Testing for Engineers by S.Prakash, PK Jain, Nem Chand & Bros.,Roorkee.
2. Engineering Soil Testing by Lambi, Wiley Eastern.
3. Engineering Properties of Soils and their Measurement by J.P.Bowles, McGraw Hill.
4. Soil Engineering in Theory and Practice, Vol.II, Geotechnical Testing and Instrumentation Alam Singh, CBS Pub.

## HYDRO POWER AND HYDRAULIC MACHINES LAB CE-223 (P)

<b>Course Code</b>	<b>CE-223(P)</b>	<b>L-0, T-0, P-2</b>	
<b>Name of the Course</b>	<b>Hydro Power And Hydraulic Machines Lab</b>		
<b>Lectures to be delivered</b>	<b>26 hours of Lab sessions in each semester</b>		
<b>Semester End Examination</b>	<b>Max. Marks: 25</b>		<b>Min. Pass Marks: 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>		<b>Max. Marks: 25</b>

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner .
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

### List of Experiments: -

1. Viscous flow analogy (Hele-Shaw apparatus) for flow net.
2. Electrical analogy for flow net.
3. Study of development of boundary layer over a flat plate.
4. Study of Magnus effect using wind tunnel
5. Study of fluid flow around a cylinder.
6. Study of fluid flow around a sphere.
7. Study of hydraulic jump in open channel flow.
8. Specific energy studies in an open channel flow.
9. Study of flow profile over a spillway.
10. Study of sluice gates.
11. Study of characteristics of Pelton Wheel
12. Study of characteristics of Francis Turbine
13. Study of centrifugal pump test rig.
14. Study of reciprocating pump test rig.



## SURVEYING - II CE – 224(P)

<b>Course Code</b>	<b>CE-224(P)</b>	<b>L-0, T-0, P-2</b>	
<b>Name of the Course</b>	<b>Surveying-II Lab</b>		
<b>Lectures to be delivered</b>	<b>26 hours of Lab sessions in each semester</b>		
<b>Semester End Examination</b>	<b>Max. Marks: 25</b>	<b>Min. Pass Marks: 10</b>	
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>	

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner .
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

### List of Experiments: -

1. Tachometric constant.
2. Determination of height and distance using Stadia tacheometry
3. Plane tabling by the method of radiation and intersection.
4. Solution of Three point problem in plane tabling
5. Setting out of simple circular curve by offsets from long chord and by successive bisection of long chord.
6. Setting out of simple circular curve by radial and perpendicular offsets.
7. Setting out of simple circular curve by one theodolite and by two theodolite method.
8. Use of total station.

**Semester-Vth**  
**PRINCIPLES OF MANAGEMENT AND CRITICAL THINKING (HS-301)**

<b>Course Code</b>	<b>HS-301</b>	<b>L - 3, T- 0, P - 2</b>	
<b>Name of Course</b>	<b>Principles of Management and Critical Thinking</b>		
<b>Lectures to be delivered</b>	<b>65 (L-39, P-26 for each semester)</b>		
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>
<b>Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			<b>MM: 50.</b>

**INSTRUCTIONS:**

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

**Course Objectives:**

- To understand the roles and functions of managers at various (entry, middle and the top) levels
- To explain the relationships between organizational mission, goals, and objectives
- To comprehend the significance and necessity of managing stakeholders
- To conceptualize how internal and external environment shape organizations and their responses
- To demonstrate empirical understanding of various organizational processes and behaviours and the theories associated with them
- To demonstrate critical thinking skills in identifying ethical, global, and diversity issues in planning, organizing, controlling and leading functions of management
- To understand organizational design and structural issues

**Learning Outcomes:** On completion of this course the students should be able to:

- Describe the functions of management.
- Outline the historical theories relating to modern management.
- Explain the role of management within a business setting.
- Describe human resource planning and staffing processes needed to achieve optimal performance
- Prepare a business forecast and budget.
- Illustrate how business ethics and social responsibility apply to organizations.
- Describe formal and informal organizational communication processes and how to influence employees

## **SECTION A**

Historical Perspectives of Management: **(6 Hours)**

- The behavioural approach to management
- The management science approach
- The contingency approach
- The system approach

Principles of Planning **(5 Hours)**

- Defining planning, Purposes of planning,
- Advantages and potential disadvantages of planning,
- Management by objectives, Planning tools,
- Strategic planning, Forecasting and budgeting

## **SECTION B**

The Management Task **(4 Hours)**

- The Role of management,
- Defining management,
- The management process, management functions,
- Management goal attainment,
- Management and organizational resources

Fundamentals of Organizing **(5 Hours)**

- The definition of organizing
- The organizing process
- The organizing subsystem
- Classical organizing theory

## **SECTION C**

Leadership and Effective Communication **(3 Hours)**

- Defining leadership; leader vs. manager,
- Leadership behaviours, Transformational Leadership,
- Coaching, Entrepreneurial leadership

Controlling for Productivity **(4 Hours)**

- Defining production and productivity,
- Quality and productivity, Operations management,
- Operations control, Using control tools to control organizations

## **SECTION D**

Managerial Ethics and Social Responsibility **(6 Hours)**

- Fundamentals of social responsibility,
- Areas of corporate social responsibility,
- Social responsiveness and decision making,
- Influencing individuals performing social responsibility activities,
- A definition of ethics, Creating an ethical workplace

Making Good Business Decision **(6 Hours)**

- Types of decisions, Elements of the decision situation,

- The decision making process, Decision making conditions,
- Decision making tools, Processes for making group decisions

**TEXT BOOKS:**

1. Charles W. L. Hill and Steven McShane (2006) Principles of Management. McGraw-Hill/Irwin; 1<sup>st</sup> Edition. ISBN-10: 0073530123, ISBN-13: 978-0073530123
2. Moore & Parker, Critical Thinking, 9th ed. (McGraw-Hill, 2008) ISBN-13: 9780073386676

**REFERENCE BOOKS:**

1. Gary Dessler (2003). Management: Principles and Practices for Tomorrow's Leaders, Prentice Hall; 3<sup>rd</sup> Edition. ISBN-10: 0131009923, ISBN-13: 978-0131009929
2. Ellen A. Benowitz (2001). Principles of Management. Cliffs Notes. ISBN-10: 076456384X, ISBN-13: 978-0764563843
3. Griffin, Ricky W., Management seventh edition, Houghton Mifflin Company
4. Fisher, Alec. The Logic of Real Arguments (Second Edition). Cambridge: Cambridge University Press, 2004.

**PRACTICAL CLASS DISCUSSION TOPICS**

Some Basics: Issues, Claims, Arguments- Types & Structures, Clarity- Vagueness, Ambiguity, Credibility, Rhetoric, & Fallacies, Formal Deductive Logic, Deductive Arguments: Truth-Functional Logic

(a) Symbolization; (b) Truth Tables; (c) Long Truth Table Test; (d) Short Truth Table Test; (e) Deductions w/Inference Rules; (f) Deductions w/Equivalence Rules

Left brain /right brain exercise, Truth and Knowledge, Good and Bad Reasoning, Inductive and Deductive Reasoning, Fallacious Reasoning, Psychological Impediments to Cogent Reasoning  
Truth, Belief, and the Leader/Follower Relationship.

## STRUCTURAL ANALYSIS-II (CE-311)

Course Code	CE-311	L-03, T-01, P-0	
Name of Course	Structural Analysis-II		
Lectures to be delivered	52 (L-39, P-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**STATICALLY INDETERMINATE STRUCTURES:** Force Methods – Introduction to Force Methods / Method of Consistent Deformations / Theorem of Least Work / Column Analogy Method / Approximate Lateral Load Analysis of Building Frames / Deflections in Statically Indeterminate Structures.

### SECTION – B

**KINEMATICALLY INDETERMINATE STRUCTURES:** Displacement Methods – Introduction to Displacement Methods / Slope Deflection Method / Moment Distribution Method / Kani's Method

### SECTION – C

**INFLUENCE LINE DIAGRAM FOR INDETERMINATE STRUCTURES:** Influence lines for indeterminate beams and trusses, Muller-Breslau Principles and qualitative plot of influence lines, influence lines for reaction, shear and bending moment in beams.

### SECTION – D

**PLASTIC ANALYSIS:** Introduction, plastic hinge concept, plastic modulus, shape factor, upper and lower bound theorems, collapse mechanics, combined mechanics, plastics analysis of beams and portal frames by equilibrium and mechanism methods, plastics moment distribution.

**TEXT BOOKS:**

1. Basic Structural Analysis by C.S. Reddy, Tata McGraw Hill Publishing
2. Indeterminate Structural Analysis by C .K. Wang, Tata McGraw Hill Publishing

**REFERENCE BOOKS:**

1. Advanced Theory of Structures by N.C. Sinha & P.K. Gayen, Dhanpat Rai and sons
2. Plastic methods of Structural Analysis by B.G. Neal, Chapman and Hall
3. Theory of Structures by B.C.Punmia, Ashok Jain, Arun Jain, Standard Publishers
4. Yuan Yu Hsieh, Elementry Theory of Structures, Prentice Hall
5. Ghali, A., Neville, A. M., Structural Analysis (Unified Classical and Matrix Approach) , Chapman and Hall Ltd.
6. Menon Devdas, Structural Analysis Narosa Publishing House
7. Menon, Devdas, Structural Analysis, Narosa Publishing House
8. Menon, Devdas, Advanced Structural Analysis, Narosa Publishing House, New Delhi.
9. R. C. Hibbeller, Structural Analysis, Pearson Education.
10. J. McCarmac and R.E.Elling, Structural Analysis: A classical and Matrix A approach, Harper and Row Publishers
11. Kinney, J.S., Indeterminate Structural Analysis ,Oxford IBH Publishing Company.

## DESIGN OF CONCRETE STRUCTURES (CE-312)

Course Code	CE-312	L-03, T-01, P-0	
Name of Course	Design of Concrete Structures		
Lectures to be delivered	52 (L-39, P-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

### INSTRUCTIONS:

- For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**Introduction:** Properties of concrete and reinforcing steel, design philosophies, limit state, ultimate load method, working stress method. Design loads, Load Combinations,

**Limit state method:** Design of Beams: Singly reinforced, doubly reinforced, rectangular, T and L beams and lintels.

### SECTION - B

**Design of Slabs:** One way and two way slabs

**Design of Stair Cases:** Types terms used, design of stairs spanning, horizontally, doglegged stairs with quarter space landing, stairs with central stringer beam.

### SECTION - C

**Design of Columns:** Subjected to eccentric and axial loading, Using S.P. 16.

**Design of footings:** Individual and combined footing and raft foundation.

### SECTION - C

**Design of retaining walls:** Various types of retaining walls, design of cantilever and counterfort retaining walls.

### TEXT BOOKS:

- Pillai, S. Unnikrishna, Menon, Devdas: Reinforced Concrete Design, Tata McGraw-Hill, New Delhi
- Varghese, P. C.: Limit state design of reinforced concrete, Prentice-Hall, New Delhi

### REFERENCE BOOKS:

- Gambhir, M. L.: Fundamentals of reinforced concrete design, Prentice-Hall, New Delhi.
- Bhavikatti, S. S.: Design of R.C.C. structural elements, New Age International Publishers, New Delhi.
- A K Jain: Reinforced Concrete (Limit state design).
- B. C. Punmia: Reinforced Concrete Structures, Luxmi Publications
- IS 456 2000: Code of Practice for Plain and Reinforced Concrete
- Limit State Design of Reinforced Concrete, 2<sup>nd</sup> Edition by Varghese, PHI Learning Private Limited.

## GEOTECHNICAL ENGINEERING-II (CE-313)

Course Code	CE-313	L-03, T-01, P-0	
Name of Course	Geotechnical Engineering-II		
Lectures to be delivered	52 (L-39, P-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**EARTH PRESSURE:** Different types of earth pressures, states of plastic equilibrium Rankine's theory and Coulomb's theory, influence water table, surcharge, wall friction and deformation on the earth pressure, application of Rankine's and Coulomb's theory to cohesionless and cohesive spoils, Coulomb's graphical method, stability considerations for retaining walls, effect of earthquakes. Design of retaining walls.

**STABILITY OF SLOPES:** Stability of finite and infinite slopes, types of failures, different factors of safety, determination of factor of safety by method of slices, Swedish circle, friction circle, Bishop's method, Mo. Gangstern- price method, Tylor's stability number, location of critical circle, stability analysis of earth dam slopes for different conditions. Design of filters and rock toe.

### SECTION – B

**SHEET PLIES:** Different types of sheet pile walls-free and fixed earth support anchored bulk heads, design principles, arching in tunnels, open cut strutting and sheeting.

**FOUNDATIONS:** Different types of loads coming on foundations, types of shallow shallow and deep foundations, footing-rafts-piles-wells-selection of foundation type-dewatering of foundations-type of explorations, methods of boring, soil samples and samplers.

### SECTION – C

**SHALLOW FOUNDATIONS:** Definition, bearing capacity, factors affecting, Terzaghi's theory of bearing capacity, effect of size, shape of ground water table, determination of bearing capacity from building codes, plate load test, penetration test, static and dynamic cone tests, house's approach, bearing capacity of sands and clays, settlements of foundation. Elastic settlements, consolidation settlements, differential settlements-permissible settlements, design



principles of depth of foundation, spread footing, combined footing, raft foundations, principles of floating frats, foundations on non-uniform soils.

**DEEP FOUNDATION:** Types of piles based on function, materials and methods of construction, friction and end bearing piles, static formulae-ENR and Hillary's formula-group action in piles, block failures, settlement of pile groups in sands and clays pile load test negative skin friction, under reamed piles.

#### **SECTION – D**

**WELL FOUNDATION:** Elements, forces acting on well, lateral stability analysis, problems in sinking of wells and remedial measures.

**MACHINE FOUNDATIONS:** model study, natural frequency of block foundation system, block foundation under vertical vibration.

**REINFORCED EARTH:** Introduction, analysis and design of reinforced earth wall, reinforced earth base.

#### **TEXT BOOKS:**

1. Soil Mechanics and Foundation Engineering by P. Purushothama Raj, Wiley India.
2. Principles of Foundation Engineering: B. M. Das, PWS Publishing Co. .

#### **REFERENCES BOOKS:**

1. Advanced Foundation Engineering: Murthy, VNS, CBS Publishers .
2. Analysis and Design of Foundation and Retaining Structures: S. Parkash & Gopal Ranjan, Sarita Prakashan Meerut.
3. Foundation Engineering: P. C. Verghese, Prentice Hall of India .
4. Theory and practice of Foundation Design: N. N. Som and S. C. Das, Prentice Hall of India
5. Foundation Engineering Handbook: H. Y. Fang, CBS Publishers.
6. Soil Engineering Theory & Practice: Alam Singh, CBS Publishers.

## HYDROLOGY AND GROUNDWATER (CE-314)

<b>Course Code</b>	<b>CE-314</b>	<b>L-03, T-01, P-0</b>	
<b>Name of Course</b>	<b>Hydrology and Groundwater</b>		
<b>Lectures to be delivered</b>	<b>52 (L-39, P-13 for each semester)</b>		
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>
<b>Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			<b>MM: 50.</b>

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**INTRODUCTION:** Scope and application of hydrology, hydrologic cycle, water budget, role of water in national development, assessment of water resources of the country, single purpose and multipurpose projects, cost benefit analysis.

**HYDROLOGICAL PROCESSES:** Precipitation, form and types of precipitation, precipitation measurement, gauge networks, hyetographs, adjustment of data, filling in missing data, average rainfall by- arithmetic mean, thissen polygon and isohyetal methods, mass curve, and depth- area-duration curve, PMP.

### SECTION – B

**WATER ABSTRACTIONS:** Evaporation, transpiration, evapo-transpiration and their estimation, methods of controlling evaporation, interception, infiltration, factors affecting infiltration, infiltration, infiltrometers, infiltration indices.

**RUNOFF:** Overland flow and runoff, factors affecting runoff, rainfall-runoff relationship, estimation of runoff.

### SECTION – C

**HYDROGRAPHS:** Hydrographs, base flow separation, unit hydrograph- its derivation and application, hydrograph from a complex storm, U.H. for other different duration, limitation of U.H. synthetic U.H.

**FLOODS:** Estimation of peak flood by empirical formulas and U.H., flood frequency studies using Gumbel's method, flood routing using Muskingum method & Modified puls method.

## SECTION – D

**GROUND WATER OCCURANCE AND QUALITY:** introduction to ground water, water bearing formations, aquifers, aquicludes and aquitards, confined and unconfined and leaky aquifers, ground water origin, modes of occurrence, yield of water and water quality.

**WELL HYDRAULICS:** Definition of terms, governing flow, equilibrium and non-equilibrium well equations, effect of hydro-geologic conditions on draw down, draw down from pumping tests, well interference and well efficiency, radius of influence, recharge and boundary conditions, effect of partial penetration, theis equation.

### **TEXT BOOKS:**

1. Groundwater Hydrology by Todd . D.K., John Wiley and Sons, New York.
2. Ground water by Raghunath, H.M., New Age International (p) Ltd.

### **REFERENCE BOOKS:**

1. Elementary Engineering Hydrology, M J Deodhar, Pearson Education
2. Water Resources Engineering by Linsley, Kohler and Phallus, Cambridge Press
3. Hydraulics of Groundwater by Jacob Bear , McGraw Hill, 1979.
4. Groundwater Resources Evaluation by Walton W.C., McGraw Hill Book Co., New York.
5. Groundwater Engineering Abdel, Aziz Ismail Kashef, McGraw Hill Book Co., New York.
6. Applied Hydrology by K.N. Mutreja, Tata Mcgraw Hill Publishing Co.
7. Ground water Engineering : K.R. Karanth
8. Engineering Hydrology by Ojha, Berndtson and Bhuniya, Oxford University Press.
9. Ground Water Hydrology, Agarwal, PHI Learning Private Limited.

## TRANSPORTATION ENGINEERING-I (CE-315)

<b>Course Code</b>	<b>CE-315</b>	<b>L-03, T-01, P-0</b>	
<b>Name of Course</b>	<b>Transportation Engineering-I</b>		
<b>Lectures to be delivered</b>	<b>52 (L-39, P-13 for each semester)</b>		
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>
<b>Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			<b>MM: 50.</b>

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**ROAD DEVELOPMENT AND PLANNING:** Brief history of road development, road cross section, necessity of transportation planning, classification of roads, road patterns, planning surveys, saturation system, highway planning in India, road development plans.

**HIGHWAY LOCATION AND ALIGNMENT:** Basic requirements of an ideal alignment and factors controlling, engineering survey for highway location, drawing and reports, highway projects.

### SECTION - B

**HIGHWAY GEOMETRIC DESIGN:** Highway cross section elements, sight distances, design of horizontal and vertical alignment.

**TRAFFIC ENGINEERING:** Traffic characteristics, traffic studies and their uses, traffic control devices, intersection, goods passenger terminals, traffic planning and administration.

### SECTION – C

**PAVEMENTS DESIGN:** Design factors, design of flexible pavements, CBR, gI and Burmister methods, design of rigid pavements.

**PAVEMENT MATERIALS:** Soils aggregates and their characteristics, bituminous materials and mixtures, Portland cement concrete.

### SECTION – D

**CONSTRUCTION OF ROADS:** Construction of water bound macadam roads, bituminous pavements, cement concrete pavements, design and construction joints in cement concrete pavements.

**HILL ROADS:** General considerations, alignment, geometric design and construction, drainage and maintenance problems in hill roads.

HIGHWAYS MAINTENANCE: Pavement failures, maintenance of highway pavement, evaluation and strengthening of existing pavements.

**TEXT BOOKS:**

1. Highway Engineering by Khanna S.K. & Justo C. E. G., Nem Chand and Brothers.
2. Traffic Engineering & Transport Planning by Kadiyali L.R., , Khanna Publishers.

**REFERENCE BOOKS:**

1. Principles of Highway Engineering and Traffic Analysis, Fred L. Mannering and Walter. P. Kilareski, Wiley.
2. Highway Engineering, Wright and Dixen, Wiley Inda
3. Fundamentals of Transportation and Traffic Operations, Pergamon, Elsevier Science Inc., New York.
4. Highway Vol. I & II by O. Flaherty C.A., Edward Arnold
5. Highway Traffic Analysis and Design, 3<sup>rd</sup> Edition, R.J. Salter and N.B. Hounsell, Macmillan
6. Highway and Transportation Engineering and Planning, G. Macpherson, Longman Scientific and Technical
7. Highway Engineering, M. Rogers, Blackwell Publishing

## STRUCTURAL ANALYSIS LABORATORY CE – 311 (P)

<b>Course Code</b>	<b>CE-311(P)</b>	<b>L-0, T-0, P-2</b>
<b>Name of Course</b>	<b>Structural Analysis Laboratory</b>	
<b>Lectures to be delivered</b>	<b>26 (P-26, for each semester)</b>	
<b>Semester End Examination</b>	<b>MM: 25</b>	<b>Min. Marks- 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

### LIST OF EXPERIMENTS:

1. To Verify the Betti's Law.
2. Study of a three hinged arch experimentally for a given set of loading and to compare the results with those obtained analytically.
3. To obtain experimentally the influence line diagram for horizontal thrust in a three hinged arch and to compare the same with the theoretical value.
4. To determine the flexural rigidity of a given beam.
5. To study the behavior of different type of struts.
6. To verify moment area theorem for slopes and deflections of a beams
7. To find the deflection of a pin-connected truss and to verify the results by calculation and graphically.
8. To determine the carry over factors for beam with rigid connections.
9. To determine the rotational stiffness of a beam when far end is (a) fixed (b) pinned.
10. Determine experimentally the horizontal displacement of the roller end of a two hinged arch for a given set of loading and to compare the results with those obtained analytically.
11. To obtain experimentally the influence line diagram for horizontal thrust in a two hinged arch and to compare the same with the theoretical value.

## CE-312 (P): CONCRETE LABORATORY

Course Code	CE-312(P)	L-0, T-0,P-2
Name of Course	Concrete Laboratory	
Lectures to be delivered	26 (P-26, for each semester)	
Semester End Examination	MM: 25	Min. Marks : 10
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%	Max. Marks : 25

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination.  
Vive-voce examination will be related to the practicals listed below and to be performed by the students during the semester.

### LIST OF EXPERIMENTS

Sr. No.	Title of the Experiment
	<b>A. Cement:</b>
1	To determine the compressive strength of cement mortar using 50 mm cube specimens.
2	To determine the tensile strength of cement mortars using Briquette specimens.
	<b>B. Fine and Coarse Aggregate:</b>
3	To determine the fineness modulus of fine aggregate.
4	To determine the fineness modulus of coarse aggregate.
5	To determine the Flankiness and Elongation indices of coarse aggregate sample.
	<b>C. Concrete:</b>
6	To determine the workability of concrete by slump test.
7	To determine the workability of concrete by compaction factor test.
8	To determine the compressive strength of concrete by cube test.
9	To determine the split tensile strength of concrete of given mix properties.
10	To determine the concrete compressive strength using rebound hammer.
11	To determine the pulse velocity of propagation of compression waves in concrete.
12	To determine the yong's modulus of elasticity of moulded concrete cylinders under longitudinal compressive stress.
13	To design concrete mix using I S method.

## Semester –VI

### Open Elective

#### ENERGY ASSESSMENT AND AUDITING - EE-300

Course Code	EE-300	L - 3, T- 0, P – 0	
Name of Course	Energy Assessment and Auditing		
Lectures to be delivered	39 (L-39 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			MM: 50.

#### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

#### SECTION A

**Energy Scenario:** Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, re-structuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

**Basics of Energy and its various forms:** Electricity basics- DC & AC currents, electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

#### SECTION B

**Energy Management & Audit:** Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments.

**Material and Energy balance:** Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

#### SECTION C

**Energy Action Planning:** Key elements, force field analysis, Energy policy purpose, perspective, contents, formulation, ratification, Organizing - location of energy management, top management support, managerial function, roles and responsibilities of energy manager,



accountability. Motivating-motivation of employees: Information system-designing barriers, strategies; Marketing and communicating-training and planning.

**Financial Management:** Investment-need, appraisal and criteria, financial analysis techniques-simple pay back period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of ESCOs.

#### **SECTION D**

**Project Management:** Definition and scope of project, technical design, financing, contracting, implementation and performance monitoring. Implementation plan for top management, Planning Budget, Procurement Procedures, Construction, Measurement & Verification.

**Energy Monitoring, Targeting and Global environmental concerns:** Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques -energy consumption, production, cumulative sum of differences (CUSUM). United Nations Framework Convention on Climate Change (UNFCCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), Prototype Carbon fund (PCF).

#### **TEXT BOOKS:**

1. L.C. Witte, P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.
2. O. Callaghn, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford.

#### **REFERENCE BOOKS:**

1. I.G.C. Dryden, "The Efficient Use of Energy" Butterworths, London.
2. W.C. turner, "Energy Management Hand book" Wiley, New York.
3. W.R. Murphy and G. Mc KAY "Energy Management" Butterworths, London.
4. Handbook of Energy Audits by Albert Thuman – Fairman Press Inc.
5. Energy basis for man and nature by Howard T.Odum & Elisbeth. C. Odum.

## TOTAL QUALITY MANAGEMENT - ME-300

<b>Course Code</b>	<b>ME-300</b>	<b>L - 3, T- 0, P – 0</b>	
<b>Name of Course</b>	<b>Total Quality Management</b>		
<b>Lectures to be delivered</b>	<b>39 (L-39 for each semester)</b>		
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>
<b>Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			<b>MM: 50.</b>

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**Introduction** - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

**Quality Control and Improvement Tools:** Check Sheet, Histogram, Pareto Chart, Cause and Effect diagram, Scatter diagram, Control chart, Graph, Affinity diagram, Tree diagram, Matrix diagram, Process decision program chart, Arrow diagram, Acceptance Sampling, Process capability studies, Zero defect program (POKA-YOKE).

### SECTION B

**TQM PRINCIPLES:** Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal – Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

### SECTION C

**TQM TOOLS & TECHNIQUES:** The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types. Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

### SECTION D

**Quality Management System & Quality Audit:** Quality Systems, Quality management principles, ISO-9000:2000, ISO 9001 : 2000, ISO 14000, Future of quality system audit, Audit

objectives, types of quality audit, Quality Auditor, Audit performance. Case studies of TQM implementation in manufacturing and service sectors including IT.

**TEXT BOOKS:**

1. Dale H. Besterfield, et al., “Total Quality Management”, Pearson Education Asia, 3<sup>rd</sup> Edition, Indian Reprint.
2. Ross, J.E.: Total Quality Management, Vanity Books International.

**REFERENCE BOOKS:**

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, South-Western (Thomson Learning).
2. Oakland, J.S., “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford.
3. Suganthi, L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd.
4. Janakiraman, B and Gopal, R.K, “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd.
5. Goetsch, D.L. & Davis, S. : Introduction to Total Quality, Prentice Hall.
6. Juran, J.M. & Gryna, F.M. : Quality Planning and Analysis, Tata McGraw Hill Publishing Co. Ltd., New Delhi
7. Charantimath, P.M. : Total Quality Management, Pearson Education.

## OPTIMIZATION METHODS FOR ENGINEERING SYSTEMS - NS-300

<b>Course Code</b>	<b>NS-300</b>	<b>L - 3, T- 0, P – 0</b>		
<b>Name of Course</b>	<b>Optimization Methods For Engineering Systems</b>			
<b>Lectures to be delivered</b>	<b>39 (L-39 for each semester)</b>			
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>	
<b>Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			<b>MM: 50.</b>	

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**Introduction:** Engineering Application; Statement of the Optimal Problem; Classification; Optimization Techniques;

**Classical Method:** Single Variable Optimization; Multivariable Optimization Without any Constraints with Equality and Inequality Constraints.

### SECTION B

**One-Dimensional Minimization Method:** Unimodal Function; Elimination Method – Dichotomous Search, Fibonacci and Golden Method; Interpolation Method – Quadratic and Cubic Interpolation Method.

**Unconstrained Minimization Method:** Univariate, Conjugate Directions, Gradient And Variable Metric Method.

### SECTION C

**Constrained Minimization Method:** Characteristics of a constrained problem; Direct Method of feasible directions; Indirect Method of interior and exterior penalty functions.

**Geometric Programming:** Formulation and Solutions of Unconstrained and Constrained geometric programming problem.

### SECTION D

**Dynamic Programming:** Concept of Sub-optimization and the principal of optimality: Calculus, Tabular and Computational Method in Dynamic Programming; An Introduction to Continuous Dynamic Programming.

**Integer Programming:** Gomory's Cutting Plane Method for Integer Linear Programming; Formulation & Solution of Integer Polynomial and Non- Linear problems.

**TEXT BOOKS:**

1. Optimization (Theory & Application)- S.S. Rao, Wiley Eastern Ltd, New Delhi.
2. Optimization Concepts and Applications in Engineering – Ashok D.Belegundu and Tirupathi R Chandrupatla – Pearson Education 1999, First India Reprint 2002.

**REFERENCE BOOKS:**

1. Optimization: Theory and Practice, C.S.G. Beveridge and R.S. Schechter, McGraw Hill, New York.
2. Kalyanamoy Deb, “Optimization for Engineering design algorithms and Examples”, Prentice Hall of India Pvt. Ltd. 2006.
3. Rao, Singaresu, S., “Engineering Optimization – Theory & Practice”, New Age International (P) Limited, New Delhi, 2000.
4. Johnson Ray, C., “Optimum design of mechanical elements”, Wiley, John & Sons, 1990.
5. Goldberg, D.E., “Genetic algorithms in search, optimization and machine”, Barnen, Addison-Wesley, New York, 1989.

## REMOTE SENSING AND GIS- CE-300

<b>Course Code</b>	<b>CE-300</b>	<b>L - 3, T- 0, P – 0</b>		
<b>Name of Course</b>	<b>Remote Sensing and GIS</b>			
<b>Lectures to be delivered</b>	<b>39 (L-39 for each semester)</b>			
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>	
<b>Continue Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			<b>MM: 50.</b>	

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**EMR AND ITS INTERACTION WITH ATMOSPHERE & EARTH MATERIAL:** Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein's Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.

**PLATFORMS AND SENSORS:** Types of platforms – orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors – resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and spaceborne TIR and microwave sensors.

### SECTION B

**IMAGE INTERPRETATION AND ANALYSIS:** Types of Data Products – types of image interpretation – basic elements of image interpretation - visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image Classification – Supervised and unsupervised.

### SECTION C

**GEOGRAPHIC INFORMATION SYSTEM:** Introduction – Maps – Definitions – Map Projections – types of map projections – map analysis – GIS definition – basic components of GIS – standard GIS softwares – Data type – Spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS).

## **SECTION D**

**DATA ENTRY, STORAGE AND ANALYSIS:** Data models – vector and raster data – data compression – data input by digitization and scanning – attribute data analysis – integrated data Analysis – Modeling in GIS Highway alignment studies – Land Information System.

### **TEXT BOOKS:**

1. Lillesand, T.M., Kiefer, R.W. and J.W. Chipman. (2004). Remote Sensing and Image Interpretation. V Edn. John Willey and Sons (Asia) Pvt. Ltd., New Delhi.
2. Anji Reddy, M. (2001). Textbook of Remote Sensing and Geographical Information System. Second edn. BS Publications, Hyderabad.

### **REFERENCE BOOKS:**

1. Lo. C.P. and A.K.W. Yeung (2002). Concepts and Techniques of Geographic Information Systems. Prentice-Hall of India Pvt. Ltd., New Delhi.
2. Peter A. Burrough, Rachael A. McDonnell (2000), Principles of GIS. Oxford University Press.
3. Ian Heywood (2000), An Introduction to GIS, Pearson Education Asia.

## OPERATING SYSTEMS- CS-300

Course Code	CS-300	L - 3, T- 0, P – 0		
Name of Course	Operating Systems			
Lectures to be delivered	39 (L-39 for each semester)			
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.	
Continue Assessment (based on sessional tests 50%) Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.			Tutorial/	MM: 50.

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**Introduction to System Software:** Overview of all system software's: Compiler, Assembler, Linker, Loader, Operating system, I/O manager

**Fundamentals of Operating System:** OS services and Components, Multitasking, Multiprogramming, Multiprocessing, Time Sharing, Buffering, Spooling, Distributed OS

### SECTION B

**Process and Thread Management:** Concept of process and threads, Process states, Process management, Context switching, Interaction between processes and OS Multithreading

Example OS : Linux

**Concurrency Control:** Concurrency and Race Conditions, Mutual exclusion requirements, Software and hardware solutions, Semaphores, Monitors, Classical IPC problems and solutions, Deadlock, Characterization, Detection, Recovery, Avoidance and Prevention

### SECTION C

**Memory Management:** Memory partitioning, Swapping, Paging, Segmentation, Virtual, memory, Overlays, Demand paging, Performance of Demand paging, Virtual memory concepts, Page replacement algorithms, Allocation algorithms, Example OS : Linux

**I/O Systems:** Secondary-Storage Structure, Disk structure, Disk scheduling, Disk management, Swap-space management, Disk reliability, Stable storage implementation, Introduction to clock, Clock hardware, Clock software

### SECTION D

**File systems:** File concept, File support, Access methods, Allocation methods, Directory Systems, File protection, Free space management, Example OS : Linux

**Protection & Security:** Protection, Goals of protection, Domain of protection, Access matrix, Implementation of access matrix, Revocation of access rights, Security, The security problem, Authentication, One-Time passwords, Threats, Example OS: Linux **Case Study:** Android OS



**TEXT BOOKS:**

1. Operating System Concepts by Silberschatz and Galvin, Wiley.
2. Operating Systems Achyut S. Godbole Tata McGraw Hill

**REFERENCE BOOKS:**

1. Operating Systems – Internals and Design Principles, by William Stallings, Prentice Hall.
2. Modern Operating Systems by Andrew S Tanenbaum, Prentice Hall India.
3. Operating Systems by Gary Nutt, Nabendu Chaki, Sarmishtha Neogy, Pearson
4. Operating Systems Design & Implementation Andrew S. Tanenbam, Albert S. Woodhull  
Pearson
5. Operating Systems D. M. Dhardhere Tata McGraw Hill

### BRIDGE ENGINEERING (CE-321)

Course Code	CE-321	L-03, T-01, P-0	
Name of Course	Bridge Engineering		
Lectures to be delivered	52 (L-39, P-13 for each semester)		
Semester End Examination	MM: 100	Min. Marks; 40	Time Allowed: 3 Hrs.
Continuous Assessment (based on sessional tests 50%) Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.	Tutorial/		MM: 50.

#### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

#### SECTION A

Introduction: Definitions, components of a bridge, classification, importance and standard specifications.

Investigation for bridge: Site selection, data drawing, design discharge linear water way, economical span, location of piers and abutments, vertical clearance above HFL, scour depth. Traffic projection, investigation report choice of bridge type.

#### SECTION B

Standard specification for Road Bridge: IRC bridge code, determination of dead loads and live loads, wind loads, longitudinal forces, centrifugal forces, horizontal forces due to water current buoyancy effect, earth pressure, temperature effect, deformation stresses, Secondary stresses, erection stresses, seismic forces.

Culverts: Design of slab culvert and box culvert.

#### SECTION C

Design of T-beam reinforced concrete bridges.

#### SECTION D

Hydraulic & Structural Design of Piers, abutments, wing-wall and approaches.

Brief Description of Bearings, joints, articulation and other details.

Bridge Foundation Design: Various types, necessary investigations and design criteria of well foundation.

#### TEXTBOOKS:

1. Essentials of Bridge Engineering, D. J. Victor, Oxford & IBH Pub. N. Delhi.
2. Design of concrete bridge : Aswani, Vazirani, Ratwani, Khanna Publishers.

#### REFERENCE BOOKS

1. Bridge Engineering by S. Ponnuswamy , McGraw Hill Publication.
2. Design of Bridges by N. Krishna Raju, Oxford & IBH, N. Delhi.
3. Bridge Deck Analysis by R. P. Pama & A. R. Cusens, John Wiley & Sons.
4. Design of Bridge Structures by T. R. Jagadish & M. A. Jairam, Prentice Hall of India, N. Delhi.

## IRRIGATION ENGINEERING (CE-322)

<b>Course Code</b>	<b>CE-322</b>	<b>L-03, T-01, P-0</b>	
<b>Name of Course</b>	<b>Irrigation Engineering</b>		
<b>Lectures to be delivered</b>	<b>52 (L-39, P-13 for each semester)</b>		
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>
<b>Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			<b>MM: 50.</b>

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**INTRODUCTION:** Definition, function, advantages and disadvantages, irrigation development in India. Water Resources of Globe; Multi purposes use of water.

**TYPES OF IRRIGATION SYSTEMS:** Lift, flow and tank irrigation, various methods of applying water to crops- Border, strip, check basin and furrow methods, sprinkler and drip irrigation methods, comparative study and efficiency of these methods.

### SECTION – B

**WATER QUALITY AND REQUIREMENT OF CROPS:** Main crops of India and their seasons, water requirement and different ages of crop growth, critical periods, delta, duty and base period, relation between them, factors effecting duty, Kor depth, Kor period, crop rotation, Paleo irrigation and irrigation efficiencies. Consumptive use, estimation and factors affecting consumptive use.

**LIFT AND LAND IRRIGATION:** Open wells and tube wells, types of tube wells, irrigation from wells, ground water field and well hydraulics.

**AGRONOMICAL ASPECTS OF IRRIGATION:** Soil water crop relationship, estimation of depth and frequency of irrigation, use of saline water for irrigation, effect of saline irrigation on crop growth, crop yield and soil fertility.

### SECTION – C

**CANAL IRRIGATION:** Types of canals, parts of canal irrigation systems, canal alignment, determination of channel capacity and storage capacity, assessment of water requirement, estimation canal losses, design of canals, regime and semi theoretical approaches.

**WATER LOGGING AND DRAINAGE:** Causes, preventive and curative measures, drainage of irrigated lands, open and tile drainage system, saline and alkaline lands and their reclamation, types of channel lining and design of lined channels.

## **SECTION – D**

**CANAL MANAGEMENT:** Requirement of irrigation outlets, classification, definitions, selection of type of outlet, design aspects, flexibility and sensitivity of outlets, assessment canal revenue.

**RIVER ENGINEERING:** Introduction, classification of river stages, methods of river training, guide banks and their design, marginal embankments, islands, stills and dykes.

### **TEXTBOOKS:**

1. Irrigation Engineering, N N Basak, , McGraw Hill Publication.
2. Elementary Irrigation Engineering, G L Asawa, New Age International.

### **REFERENCE BOOKS**

1. Irrigation Engineering & Hydraulic Structures by S.R. Sahasrabudhe, S K Kataria & Sons-New Delhi
2. Irrigation Engineering & Hydraulic Structures by S.K. Garg
3. Fundamentals of Irrigation Engineering by Bharat Singh, Nem Chand Bros. Roorkee
4. Irrigation Water Management (Principles & Practices) by Dilip Kumar Majumdar, Prentice Hall of India (P), Ltd.

## TRANSPORTATION ENGINEERING-II (CE-324)

<b>Course Code</b>	<b>CE-324</b>	<b>L-03, T-01, P-0</b>		
<b>Name of Course</b>	<b>Transportation Engineering</b>			
<b>Lectures to be delivered</b>	<b>52 (L-39, P-13 for each semester)</b>			
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>	
<b>Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>				<b>MM: 50.</b>

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**URBAN TRANSPORTATION PLANNING:** Introduction, Transportation system management, Transportation plan, Travel forecasting, Trip generation models – Multiple linear regression analysis, Category analysis, Trip Distribution – Fratar method, Gravity model, Mode usage – Trip interchange mode choice models, Trip assignment- Minimum path techniques.

### SECTION – B

**AIRPORTS: INTRODUCTION:** Brief history of air navigation, role of civil engineering, brief history of ICAO

**AIRCRAFT CHARACTERISTICS:** Size, capacity, range speed and their Trends, components of aircrafts, weight turning radios and wheel load configurations.

**AIRPORT PLANNING:** Regional planning, topographical features, population, existing air port in the vicinity, air traffic characteristics, development of new airports, airport site selection and factors effecting it.

**AIRPORT OBSTRUCTIONS:** Zoning, classification of obstructions, imaginary surfaces, approach zone and turning zones.

**AIRPORT LAYOUT:** Runway design, airport capacity and configuration, loading apron, service hanger, taxiway design, terminal area.

**MISCELLANEOUS:** Airport marking and lightings, drainage systems, airport pavement design.

### SECTION – C

**RAILWAYS:** Railway track developments, component parts, gauges, wheel and axle arrangements, resistances to traction and stresses in track, various resistances and their evaluation, hauling capacity and tractive effort, stress in rail, sleepers, ballast and foundation.

**TRACK COMPONENTS:** Permanent way, component parts, coning of wheelks, rails, creep, wear failure, joints, sleepers- requirement types, rail fittings and fixtures, ballast requirements, drainage, ballastless track, sub grade and embankments.

**GEOMETRIC DESIGN:** Track alignment, horizontal curves super elevation, equilibrium cant and cant deficiency, transition curves, vertical curves gradients and grade compensation, widening of gauge on curves.

**POINTS AND CROSSINGS:** Design of simple turn out, various types of track junctions.

**SIGNALLING AND INTERLOCKING;** Principles and classification of signals, control of movement of trains, track circuitry, fuctions and methods of interlocking, track drainage and maintenance.

### **SECTION – D**

**TUNNELING:** Necessity, shape, size, alignment, shafts, pilot tunnel, tunneling through soft ground, through rocks, drilling, safety measures, ventilation, lightening, drainage and tunneling machinery.

### **TEXTBOOKS:**

1. A textbook of Railway Engineering by Saxena & Arora.
2. Railway Engineering by Satish Chandra and M M Agarwal, Oxford University Press.

### **REFERENCE BOOKS**

1. Irrigation Engineering & Hydraulic Structures by S.R. Sahasrabudhe, S K Kataria & Sons.
2. Airport planning and design by Khanna, Arora & Jain, Nem Chand Publishers
3. Airport Engineering by S. C. Rangwala, Charotar Publishing Co.
4. Planning and design of airports, by Robert Horenjeff & Francis X McKelvy, Mc Graw Hill.
5. Indian Railway tracks by Agarwal M.M.
6. Transportation Engineering by Vazirani and Chandola, S.P., Khanna Publishers.
7. Transportation Engineering by K. P. Subramaniam, SCITECH Publishers.

## WATER SUPPLY AND SYSTEM ENGINEERING (CE-350)

<b>Course Code</b>	<b>CE-350</b>	<b>L-03, T-01, P-0</b>	
<b>Name of Course</b>	<b>Water Supply and System Engineering</b>		
<b>Lectures to be delivered</b>	<b>52 (L-39, P-13 for each semester)</b>		
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>
<b>Continuous Assessment (based on sessional tests 50%) Tutorial/ Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			<b>MM: 50.</b>

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**WATER ENVIRONMENT:** Environment, water resources of hydrosphere, different water pollutants and their impacts on human beings, sources of supply, yield, design of intakes, estimation of demand, design period.

**WATER/ WASTEWATER CHARACTERISTICS:** Water quality criteria and standards for potable and industrial uses, control of waterborne diseases. Physical, chemical, and biological characteristics of domestic and industrial wastewaters, significance of pollutant parameters and effluent discharge standards.

### SECTION – B

**TREATMENT OBJECTIVES AND METHODS:** Unit operations and processes and selection of treatment mode and sequence

Primary treatment – screening, neutralization, equalization, flocculation, sedimentation, floatation, stripping.

Secondary treatment - suspended and attached biological growth systems for aerobic, anaerobic, and anoxic processes, lagoons and stabilization ponds.

Tertiary treatment – Oxidation/ reduction, precipitation, adsorption, ion exchange and membrane (RO/UF) processes, disinfection.

Wastewater/ sludge disposal – self-purification, oxygen sag analysis, land treatment Sludge – Treatment, dewatering, conditioning, digestion.

### SECTION – C

**CONVEYANCE/ DISTRIBUTION SYSTEMS:** Conductors – different pipe systems, design considerations, laying, testing and effects of pipe corrosion and its preventive measures.

Sewers – Hydraulic design, construction and appurtenances, operation and maintenance.

Pumps and pumping – necessity, types of pumps, characteristics curves, selection criteria, economical diameter of pumping/ transmission main, problems in sewage pumping.  
Distribution network – methods, layout, storage, and distribution reservoir, analysis of distribution systems.

#### **SECTION – D**

**PLUMBING SYSTEMS:** General principles, materials for service pipe, service connection, water meters, valves. Principles of house drainage, pipes, traps, sanitary fittings, systems of plumbing, house drainage plans.

**RURAL AND SEMI-URBAN SANITATION:** Collection and disposal of dry refuse, sullage, excretal waste, night soil disposal without water carriage, PRAI latrines, chemical toilets, pre-cast units for low cost sanitation

#### **TEXTBOOKS:**

1. Elements of Water Supply and Wastewater by G.M. Fair, G.C. Geyer, D.A. Okun, New Age International Publishers.
2. Environmental Engineering (Vol I &II) by B.C. Punmia and A. Jain, Laxmi Publications

#### **REFERENCE BOOKS:**

1. Wastewater Engineering – Treatment and Reuse, Metcalf & Eddy Inc.
2. Environmental Engineering (Vol I&II) by P.N.Modi, Standard Book House.
3. CPHEEO (Ministry of Urban Development, New Delhi). Manual on
  - i. Water Supply and Treatment
  - ii. Sewerage and Sewage Treatment
4. Water Supply & Sewerage by McGhee, T. J., McGraw Hill International Edition, New Delhi.
5. Environmental Engineering by H. S. Peavy, D. R. Row and G. Tchobanoglous, McGraw Hill International Edition.



## ESTIMATION AND COSTING (CE-326)

<b>Course Code</b>	<b>CE-326</b>	<b>L-03, T-01, P-0</b>	
<b>Name of Course</b>	<b>Estimation and Costing</b>		
<b>Lectures to be delivered</b>	<b>52 (L-39, P-13 for each semester)</b>		
<b>Semester End Examination</b>	<b>MM: 100</b>	<b>Min. Marks; 40</b>	<b>Time Allowed: 3 Hrs.</b>
<b>Continuous Assessment (based on sessional tests 50%) Tutorial/Assignment: 30%, Quiz/ Seminar: 10 %, Attendance: 10 %.</b>			<b>MM: 50.</b>

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**ESTIMATING:** Different types of estimates, methods of taking out and scheduling quantities for the following works. Building, culverts, bridges, irrigation works, steel structures, road works, canal works, sanitary and water supply works, roofs, R.C.C. work, Deductions for openings.

**ANALYSIS OF RATES:** Scheduling of rates, analysis of rates, problem in analysis of rates of the following items: earth work, brick masonry, stone masonry, cement concrete, RCC work, iron work, plastering, flooring, white washing, painting, wood work, Road work .

### SECTION - B

**SPECIFICATIONS:** Object of specifications, general specifications, detailed specifications of the following: earth work in foundation, lean concrete in foundation, lime concrete in roof terracing, cement concrete, RCC, brick work, plastering, painting, C.C. floor, mosaic floor, white washing, distempering, varnishing, painting, doors and windows, DPC, centering and shuttering, stone masonry, cement mortar, lime mortar, brick ballast, surkhi, cinder and sand.

### SECTION – C

**ACCOUNTS PROCEDURES;** Regular and work charged establishment, pay bill, ACR, classifications of works, contract, tender, tender notice, earnest money, security money, arranging contract, power of accepting tender, daily labour, muster roll, classification of contracts, penalty, measurement book, account procedures of stores, issue rate, stock accounting, form number 7,8,9,10,11,35,37, bill voucher, first and final bill, advance payment, hand receipt, refund of security money, cash book, imprest, deposit works, temporary advances, treasury challan, inventory, administrative approval, competent authority, building bye laws, arbitration.

## **SECTION – D**

VALUATION: Gross income, net income, outgoing, scrap value, salvage value, obsolescence, annuity, capitalized value, year's purchase, sinking fund, depreciation, valuation of building, determination of depreciation, method of valuation, life of various items of works, mortgage-lease, fixation of rates, plinth area required for residential building.

### **TEXT BOOKS:**

1. Estimating & Costing in Civil Engg.: Theory & Practice by B.N. Dutta, UBS Publishers Distributors Ltd.
2. Estimation and Costing in Civil Engineering, by Birdie, G.S., Dhanpat Rai Publishing Co. Ltd, New Delhi, 2011.

### **REFERENCE BOOKS:**

1. Estimation, Costing, Specifications and Valuation in Civil Engineering, Chakraborti, M, National Half-tone Co. Calcutta.
2. Building Construction Estimating by George H. Cooper.
3. Estimating and Costing for Building & Civil Engg. Works by P.L. Bhasin.
4. Standard Schedule of rates and standard data book by Public Works Department.
5. I. S. 1200 ( Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)

## CIVIL ENGINEERING SOFTWARE LABORATORY- CE – 320 (P)

<b>Course Code</b>	<b>CE-320(P)</b>	<b>L-0, T-0, P-3</b>
<b>Name of Course</b>	<b>Civil Engineering Software Laboratory</b>	
<b>Lectures to be delivered</b>	<b>26 (P-26, for each semester)</b>	
<b>Semester End Examination</b>	<b>MM: 25</b>	<b>Min. Marks- 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

### LIST OF EXPERIMENTS:

1. AUTOCAD Software  
This course covers the essentials of AutoCAD Civil 3D. Students learn how to work with point data in AutoCAD Civil 3D; create and analyze a surface; develop a site; model corridors, and pipe networks; work with survey data; and import and export data.
2. STAAD PRO or Equivalent software,  
EXERCISES:
  1. 2-D Frame Analysis and Design
  2. Steel Tabular Truss Analysis and Design

## TRANSPORTATION ENGINEERING LABORATORY - CE – 324 (P)

<b>Course Code</b>	<b>CE-324(P)</b>	<b>L-0, T-0, P-2</b>
<b>Name of Course</b>	<b>Transportation Engineering Laboratory</b>	
<b>Lectures to be delivered</b>	<b>26 (P-26, for each semester)</b>	
<b>Semester End Examination</b>	<b>MM: 25</b>	<b>Min. Marks- 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

### LIST OF EXPERIMENTS:

1. To determine the impact value of aggregate sample
2. To determine the crushing value of aggregate sample
3. To determine the flakiness and elongation index of aggregate sample
4. To perform Los Angeles Abrasion test on aggregate sample
5. To determine the CBR value of a given soil sample
6. To carry out the grain size analysis of course aggregates & fine aggregates
7. To perform penetration test on bitumen sample
8. To determine the softening point of bitumen sample
9. To determine the specific gravity and water absorption of aggregate sample
10. To determine the ductility value of a bitumen sample.
11. To conduct Marshall's stability test on bituminous mix.
12. To determine the stripping value of coarse aggregate coated with bitumen

## ENVIRONMENTAL ENGINEERING LABORATORY - CE – 350 (P)

<b>Course Code</b>	<b>CE-350(P)</b>	<b>L-0, T-0, P-2</b>
<b>Name of Course</b>	<b>Environmental Engineering Laboratory</b>	
<b>Lectures to be delivered</b>	<b>26 (P-26, for each semester)</b>	
<b>Semester End Examination</b>	<b>MM: 25</b>	<b>Min. Marks- 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

### LIST OF EXPERIMENTS:

1. To find the turbidity and colour of a given sample of water.
2. To determine the pH value of a given sample of water.
3. To determine the conductivity of a given sample of water.
4. To find out total dissolved solid, settleable solids and suspended solids of the given sample.
5. To determine the carbonate, bicarbonate, and hydroxide alkalinity of a sample.
6. To find out the concentration of chlorides in the given sample of water.
7. To estimate the hardness of the given sample of water by standard EDTA method
8. To find the optimum amount of coagulant required to treat the turbid water by Jar Test.
9. To determine residual chlorine in a given sample of water.
10. To determine MPN of coliforms of the given sample.
11. To determine the metal & metalloids of the given sample.
12. Determination of Fluorides.
13. Jar test for optimum coagulant dose estimation.

**VII Semester**  
**PRESTRESSED CONCRETE CE-411(a)**

Course Code	<b>CE-411(a)</b>	L-3, T-1, P-0	
Name of the Course	<b>Prestressed Concrete</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, T=13 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

**INSTRUCTIONS:**

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

**SECTION A**

**INTRODUCTION:** Historic development – General principles of prestressing pretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics.

I.S.Code provisions, Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford –Udall System.

**SECTION B**

**LOSSES OF PRESTRESS:** Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

Analysis of sections for flexure; Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.

**SECTION C**

**DESIGN OF SECTIONS FOR FLEXURE AND SHEAR:** Allowable stress, Design criteria as per I.S.Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile.

**ANALYSIS OF END BLOCKS:** by Guyon's method and Mugnel method, Anchorage zone stresses – Approximate method of design – Anchorage zone reinforcement – Transfer of prestress pre-tensioned members.

**SECTION D**

**Composite section:** Introduction – Analysis of stress – Differential shrinkage – General designs considerations.

DEFLECTIONS OF PRESTRESSED CONCRETE BEAMS: Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members prediction of long term deflections.

**TEXT BOOKS:**

1. Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications.

**REFERENCE BOOKS:**

1. Prestressed Concrete by Ramamrutham; Dhanpatrai Publications.
2. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons.

**Codes:** BIS code on prestressed concrete, IS 1343.

## FINITE ELEMENT METHODS IN CIVIL ENGINEERING CE-411(b)

Course Code	<b>CE-411(b)</b>	L-3, T-1, P-0	
Name of the Course	<b>Finite Element Methods in Civil Engineering</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, T=13 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

Introduction: Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh – Ritz method of functional approximation.

Principles of Elasticity: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with axi-symmetric loading.

### SECTION B

One Dimensional FEM : Stiffness matrix for bar element - shape functions for one dimensional elements – one dimensional problems.

Two Dimensional FEM : Different types of elements for plane stress and plane strain analysis – Displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates

### SECTION C

Generation of element stiffness and nodal load matrices for 3-node triangular element and four node rectangular elements.

Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis -formulation of CST element, 4 –noded and 8-noded iso-parametric quadrilateral elements –Lagrangian and Serendipity elements.

### SECTION D

Axi-symmetric analysis- Basic principles-Formulation of 4-node iso-parametric axi-symmetric element

Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.



**TEXT BOOKS:**

1. Finite Elements Methods in Engineering by Tirupati.R. Chandrepata and Ashok D. Belegundu - Pearson Education Publications.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers.

**REFERENCE BOOKS:**

1. Finite element analysis by S.S. Bhavakatti-New age international publishers
2. Finite element analysis by David V Hutton, Tata Mcgraw Hill, New Delhi
3. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David
4. S. Malkus and Michael E.Plesha. Jhon Wiley & Sons.
5. Text book of Finite Element analysis by P.Seshu – Prentice Hall of India.

## OPEN CHANNEL FLOW CE-411(c)

Course Code	<b>CE-411(c)</b>	L-3, T-1, P-0	
Name of the Course	<b>Open Channel Flow</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, P = 13 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

Types of open channels, Prismatic and non prismatic channel, classification of flows, continuity equation, energy and momentum correction factors.

### SECTION – B

Specific energy, critical depth, critical flow computations, flow transitions. Uniform flow, Chezy's and Mannings equation, roughness coefficients, equivalent roughness, Hydraulically efficient channel cross sections.

### SECTION – C

Gradually varied flow, governing equation, classification and analysis of flow profiles, GVF computations.

### SECTION – D

Hydraulic jump, momentum equation for jump, classification of jumps, energy dissipation using hydraulic jump, location of jump. Rapidly varied flow measurements, spatially varied flow. Introduction to unsteady flow.

### TEXT BOOKS:

1. Open Channel Hydraulics by Chow, V.T., Blackburn Press
2. Flow in Open Channel by Subramanya, K., Tata McGraw Hill Publications, New Delhi,

### REFERENCE BOOKS:

1. Introduction to Fluid Mechanics by Robert W. Fax, Philip J. Pritchard, Alan T. McDonald,, Student Edition 7th, Wiley India Edition, 2011.
2. Open Channel Flow: K. G. Rangaraju
3. Fluid Mechanics by Franck M White, Tata McGraw Hill Publication, 2011.

## DESIGN OF STEEL STRUCTURES CE-412

Course Code	CE-412	L-3, T-1, P-0	
Name of the Course	Design of Steel Structures		
Lectures to be delivered	52 (1 Hr Each) (L = 39, P = 13 for each semester)		
Semester End Examination	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max. Marks: 50

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**Structural Steel:** Types, properties and products

**Basis of Structural Design:** Structural systems, Loads and load combinations, Codes and specifications, Design Philosophies, Failure criteria for steel

**Design of tension members:** Types of tension members, Slenderness ratio, behavior, modes of failure, Angle under tension, other sections, design of axially loaded tension members, design of lug angle, splices and gussets.

### SECTION –B

**Plastic and Local Buckling Behaviour:** Plastic theory, Plastic collapse load, Plastic collapse theorem, Method of plastic analysis, Plastic design of Portal frames, Local buckling of plates, Cross section classification, Behaviour and ultimate strength of plates.

**Design of compression members:** Possible failure modes, Behaviour, development of multiple column curves, Sections for compression members, effective length, Single angle struts, design of column, cross section (single and built up sections), Column bases and caps, displacement

### SECTION –C

**Design of beams:** Beam types, section classification, Lateral stability, Effective length, design of Laterally supported beams, design of laterally unsupported beams, Shear strength of steel beams, Maximum deflection, web buckling, crippling, purlins, design of beams.

**Design of Beam Columns:** General behaviour, equivalent moment factor, nominal strength, interaction equation for local capacity check, design of beam column, beam column subjected to tension and bending, design of eccentrically loaded base plates.

## SECTION –D

**Bolted Connections:** Bolts, bolted connections, behaviour, ordinary black bolts, HSFG bolts, Simple connections, Moment resisting connections, Beam to beam connection, Beam and column splice

**Welded Connection:** welding processes, electrodes, advantages, types and properties, joints, weld symbols, weld specifications, Effective area of weld, design of weld, simple joints, moment resisting connections, continuous beam to column connection, beam and column splice.

### TEXT BOOKS:

1. Subramanian, N, Design of steel structures, Oxford University Press, New Delhi
2. Duggal , S. K., Design of steel structures, Tata McGraw-Hill, New Delhi

### REFERENCE BOOKS:

1. Trahair, N.S., The behaviour and design of steel structures, Taylor & Francis, London.
2. Chandra, Ram, Design of steel structures, Standard Publishers, Delhi.
3. Bhavikatti, S.S., Design of steel structures by limited method as per IS 800-2007, I.K. International Publishing House, New Delhi

**IS CODES:** IS 800 – 2007, Code of Practice for general construction in steel, Bureau of Indian Standards, 2007

## DESIGN OF HYDRAULIC STRUCTURES CE-413

Course Code	<b>CE-413</b>	L-3, T-1, P-0	
Name of the Course	<b>Design of Hydraulic Structures</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, P = 13 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION –A

**CANAL HEAD WORKS:** Introduction, functions, layout, selection of site for diversion head works, various components and their functions, design of weirs on permeable foundation by Bligh's creep theory, Khosla's method of independent variables, use of Khosla's charts, silt ejectors and their design principles.

**CANAL REGULATION WORKS:** Canal head regulators, cross regulators and distributory head regulator, their functions, Design of canal head regulator & distributory head regulators.

### SECTION – B

**CANAL FALLS:** Necessity, types location of canal falls, types, design of Sarda and Glacis falls, energy dissipation devices and arrangements.

**CROSS DRAINAGE WORKS:** Introduction, types of cross drainage works and their selection, design of aqueduct.

### SECTION – C

**STORAGE WORKS:** Investigation and planning for reservoirs, capacity and yield, storage works, types of dams and their choice, selection of suitable site.

**GRAVITY DAMS:** Types, selection of site, forces acting, stability criterion, Analysis of gravity dam.

**EARTH DAMS:** Design aspects of earth dams, seepage through earth dams, seepage control, design of filters.

### SECTION – D

**ARCH DAMS:** Constant angle and constant center arch dams (simple design and sketch), buttress and multiple arch dams (Principle and sketch).

**SPILWAY AND STILLING BASINS:** Introduction, spillway capacity, different types, energy dissipation below spillways, stilling basins: Type-I & II, gates and valves aerators.

**TEXT BOOKS:**

1. Irrigation Engineering & Hydraulic Structures by S.R. Sahasrabudhe, S K Kataria & Sons- New Delhi
2. Hydraulic Structures by Novak, P., Moffat, A. I. B., Nalluri, C and Narayan, R, Taylor & Francis.

**REFERENCE BOOKS:**

1. Irrigation Engineering and Hydraulic Structures by Garg, S.K., Khanna Publishers.
2. Handbook of Dam Engineering by Golze, A. R., Von Rostrand Reinhold Co.
3. Sharma, H.D., Concrete Dams, CBIP Publication, 1998.
4. Siddiqui, I H, Dams and Reservoirs: Planning, Engineering, Oxford University Press.
5. Theory and Design of Irrigation Structures Vol.I and II : R.S.Varshney
6. Fundamentals of Irrigation : Bharat Singh , Nem Chand Bros. Roorkee

## WASTE AND SEWAGE TREATMENT CE-414

Course Code	<b>CE-414</b>	L-3, T-1, P-0	
Name of the Course	<b>Waste and Sewage Treatment</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, P = 13 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

- 1. For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- 2. For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

#### SECTION –A

**SOLID WASTE MANAGEMENT:** Solid waste generation, onsite handling, storage and processing, collection, transfer and transport, processing techniques and equipments, recovery of resources, conversion products and energy, disposal.

**HAZARDOUS WASTE MANAGEMENT:** Exposure and risk assessment, environmental legislation, characterization and site assessment, waste minimization, incineration, transportation, storage, landfill disposal facility siting, site remediation.

#### SECTION - B

**BIOMEDICAL WASTE MANAGEMENT AND HANDLING:** Biomedical waste management issues, waste generation, current practices in health care facilities, environmental concerns, labeling and color coding for waste storage, collection, transportation, treatment, common treatment facility, disposal.

#### SECTION – C

**ECOLOGY AND ENVIRONMENT:** Role of ecology in environmental issues, salient features of major ecosystems, energy transfer, local, regional and global impacts, ecological chain and balance, quantitative ecology in the context of environmental impact assessment of development projects.

#### SECTION – D

**AIR POLLUTION:** Sources, emission of gases, suspended particulate matter, classification dynamics of pollutant dispersion and disposal, effects on environment including living and non-living matter, remedial measures and their effectiveness, environmental assessment, acts relating to air pollution, standards.

NOISE POLLUTION: Properties of sound waves, characterization of noise, kinetics of noise, rating systems, measurement and control, standards.

**TEXT BOOKS:**

1. Integrated Solid Waste Management by G.Tchobanoglous, H.Theisen, S.Vigil., Mc Graw Hill Inc.
2. Wastewater Engineering - Collection, Treatment, Disposal and Reuse, by Metcalf and Eddy, McGraw Hill Pub. Co.

**REFERENCE BOOKS:**

3. Hazardous Waste Management, C.A. Wentz. Tata McGraw Hill Inc.
4. Hazardous Waste Management, M.D. LaGrega, P.L. Buckingham and J.C. Evans, published by McGraw Hill (1994)
5. Industrial Waste Treatment, by Nelson Leonard Nemerow, Butterworth-Heinemann.
6. Solid Waste Engineering, by Vesilind PA, Worrell W and Reinhart D, Brooks/Cole Thomson Learning Inc.
7. Hand Book of Environmental Laws, Acts, Rules, Guidelines Compliances and Standards (Vol I & II).
8. CPHEEO (Ministry of Urban Development, New Delhi). Manual on Municipal Solid Waste Management



## PROJECT PLANNING AND CONSTRUCTION EQUIPMENTS CE-415

Course Code	<b>CE-415</b>	L-3, T-1, P-0	
Name of the Course	<b>Project Planning and Construction Equipments</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, P = 13 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

- For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

#### SECTION –A

**CONSTRUCTION PLANNING AND NETWORK TECHNIQUES:** An overview of planning process, Planning through bar charts, mile stone charts, difference between CPM and PERT, basic concept of network preparation, applications in construction planning, scheduling and control, funds, material, labour and equipment planning using network technique.

#### SECTION - B

**CONSTRUCTION ORGANISATION AND MANAGEMENT:** Different types of organization, their structures, advantages and limitation, Quality control in construction, Cost account and motivation.

#### SECTION – C

**SYSTEM TECHNIQUES IN CONSTRUCTION:** An overview of systems techniques with special reference to their applications in construction. These includes LP and its extensions viz. assignment and transportation problems, queuing theory.

#### SECTION – D

**CONSTRUCTION PLANT AND EQUIPMENT:** Preparatory work, Factors affecting selection of equipment, Bulldozer, Dumpers, Trenchers, Excavators, Hoe, Hoists, Graders, Piling hammers, Pumps, Compressors, Bitumen mix plant, Rollers, Clam shell, Aggregate production techniques, Crushers, Concrete production, Jumbo, mucker, muck cars, Steam curing.  
**SAFETY IN CONSTRUCTION:** Causes of accidents, preventive measures.

**TEXT BOOKS:**

1. Project Planning and Control with PERT and CPM, by B.C. Punmia and Khandelwal K.K., Laxmi Publication Delhi.
2. Construction Planning Equipment and methods, by Puerifoy R.L., McGraw-Hill Co.,

**REFERENCE BOOKS:**

1. Project Management, by Choudhary S, Tata McGraw Hill Publishing Co.
2. Construction Planning and Equipment by Satyanarayanan and Saxena, Standard Publishers and distributors, New Delhi
3. PERT and CPM by L.S Srinath, Affiliated East-West Press Pvt Ltd
4. Srivastva, U.K., "Construction, Planning Management", Galgotia Publisher.
5. Ramaswamy, R., "Practical Handbook on Construction Management for Architects and Engineers", Nabhi Publications.

### STRUCTURAL DRAWING CE-412(P)

<b>Course Code</b>	<b>CE-412(P)</b>	<b>L-0, T-0, P-3</b>
<b>Name of Course</b>	<b>Structural Drawing</b>	
<b>Lectures to be delivered</b>	<b>26 (P-26, for each semester)</b>	
<b>Semester End Examination</b>	<b>MM: 25</b>	<b>Min. Marks- 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

#### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

#### LIST OF DRAWINGS:

Indian standard specification for Drawing.

Structural Drawing of reinforced concrete Structures: Rectangular Beam, T- Beam, L- Beam, One way and Two way slab, Flat slab, Waffle Slab, Doglegged staircases, Open Well type, tread rise staircase, cantilever/ spiral staircase, Columns, Isolated Footing, strip, raft and pile foundation, Water tank, Retaining walls.

Structural Drawing of steel structures: Bolted and welded Connections, trusses, lacing and battening, Column splices, Column Bases, plate girders.

## WASTE AND SEWAGE TREATMENT LABORATORY CE-414(P)

<b>Course Code</b>	<b>CE-414(P)</b>	<b>L-0, T-0, P-2</b>
<b>Name of Course</b>	<b>Waste and Sewage Treatment Laboratory</b>	
<b>Lectures to be delivered</b>	<b>26 (P-26, for each semester)</b>	
<b>Semester End Examination</b>	<b>MM: 25</b>	<b>Min. Marks- 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

### List of Experiments:

1. Determination of DO.
2. Determination of BOD.
3. Determination of COD.
4. Determination of Sulphates.
5. Determination of Nitrite and Nitrate nitrogen.
6. Determination of Ammonical and Total Kjeldhal Nitrogen.
7. Determination of phosphorus (total and available).
8. Determination of SVI (including MLSS and MLVSS estimations).

**Semester –VIII**  
**Elective –II**  
**ROCK MECHANICS CE-421(a)**

Course Code	CE-421(a)	L-3, T-1, P-0	
Name of the Course	Rock Mechanics		
Lectures to be delivered	52 (1 Hr Each) (L = 39, P = 13 for each semester)		
Semester End Examination	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			Max. Marks: 50

**INSTRUCTIONS:**

- For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

**SECTION A**

**Introduction:** Rock Mechanics and its relationship with soil mechanics and engineering geology, application of rock mechanics to civil engineering problems.

**Classification of rocks:** Lithological classification, engineering classification of rocks, classification based on wave velocity ratio, R.Q.D. Classification of rock masses i.e. RMR and Q systems.

**SECTION B**

**Rock properties:** Laboratory test, compression, tensile, void index, permeability and shear, effects of size of specimen, rate of testing, confining pressure etc. Stress strain curves of typical rocks, strength of intact and fissured rocks, effects of anisotropy, saturation and temperature effects, shear strength of jointed rock mass.

**Field test:** Uniaxial tests in tunnels and open excavations, shear test, pressures tunnel tests etc.

**SECTION C**

**Stability of rock slopes:** Mode of failure of rock slopes, plane wedge analysis, 3D-wedge analysis circular mode of failure, back analysis of slopes, stability charts, types and design of rock bolts.

**Determination of in situ stresses:** Stresses in rock, methods of determining in situ stresses i.e hydraulic fracturing, flat jack test and over coring.

## SECTION D

**Design of tunnels:** Rock pressure theories, ground reaction curve, rock support interaction analysis empirical and semi empirical methods of analysis, simple method of tunnel, design, types and design of tunnel lining.

**Foundation of rocks:** Stress distribution in foundation, methods of determination of bearing capacity of rocks, improvement of rock properties, pressure grouting for tunnels and dams, dental concreting, shear zone treatment.

### TEXT BOOKS:

1. Introduction to Rock Mechanics, by Goodman R.E., John Wiley and Sons, New York.
2. Rock Mechanics for Underground Mining, by Brady B.H.G. and Brown E.T., Kluwer Academic Publishers.

### REFERENCE BOOKS:

1. Engineering in Rocks for Slopes, Foundations and Tunnels, by Ramamurthy T., PHI Learning Pvt. Ltd.
2. Rock Mechanics in Engineering Practice: K.G. Stagg , Jojn Wiley & Sons.
3. Under ground excavation in rock: Evert Hoek, Edwin T. Brown, Institution of Mining and Metallurgy
4. Rock Mechanics in Engineering Practice : by C Jaeger, Cambridge University

## REMOTE SENSING AND G I S CE-421(b)

Course Code	<b>CE-421(b)</b>	<b>L-3, T-1, P-0</b>	
Name of the Course	<b>Remote Sensing and G I S</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, P = 13 for each semester)</b>		
<b>Semester End Examination</b>	<b>Max. Time = 3 hrs.</b>	<b>Max. Marks: 100</b>	<b>Min. Pass Marks: 40</b>
<b>Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)</b>			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**INTRODUCTION:** Introduction to Remote Sensing data – acquisition and processing, Sensor Systems, applications, Electromagnetic Radiation (EMR) and its characteristics, Radiation principles: Planck’s Law, Stefan Law, Wein’s Displacement Law, Kirchoff’s Law, Properties of solar Radiant energy, atmospheric windows.

### SECTION – B

**PHYSICAL BASIS OF REMOTE SENSING:** Interaction in the atmosphere: Nature of atmospheric interaction, atmospheric effects on visible, near infra-red, thermal and microwave wavelengths, interaction at ground surface, interaction with soils and rocks, effects of soil moisture, organic matter, particle size and texture, interaction with vegetation, spectral characteristics of individual leaf, vegetation canopies, effect of leaf pigments, cell structure, radiation geometry.

### SECTION – C

**PLATFORM AND SENSORS:** Multi concept in remote sensing, general requirements of a platform, balloon aircraft, satellite platforms, sun-synchronous orbits, sensors for visible and near infra-red wavelengths, profilers, images, scanners, radiometers, optical-mechanical and push button scanners, spectral, spatial, radiometric and temporal resolution, IFOV, FOV, Geometric characteristics of scanners, V/H ratio, comparison of some satellite /aerial platforms and sensors and remote sensing data products, Landsat MSS and TM, SPOT, IRS, ERS etc.

## **SECTION – D**

**GEOGRAPHICAL CONCEPTS AND TERMINOLOGY:** Difference between Image Processing System and Geographical System (GIS), Utility of GIS, Various GIS Packages and their Salient Features, Essential Components of A GIS, Scanners and Digitisers, Raster and Vector Data, Data Storage, Hierarchical data, Network Systems, Relational database, Data Management, Conventional database Management Systems, Spatial Database Management, Data manipulation & analysis, Reclassification and aggregation, Geometric and Spatial operation on Data Management and Statistical Modeling, Applications of GIS in various Natural Resources & Engineering applications.

### **TEXT BOOKS:**

1. Remote sensing and image Interpretation, by Lillisand T.M and Kiefer R.W, John Wiley and Sons.
2. Concepts and Techniques of Geographic Information Systems, by C.P. Lo, Albert K. W. Yeung, Prentice Hall India Pvt. Ltd, New Delhi.

### **REFERENCE BOOKS:**

1. Remote sensing principles and interpretation, by Floyd F. Sabins, W.H. Freeman and Co.
2. Elements of photogrammetry, with air photo interpretation and remote sensing, by Paul R. Wolf, McGraw Hill International Book Company.
3. Introduction to Geographic Information Systems, by Kang-Tsung Chang, Tata McGraw Hill Publishing Company Ltd, New Delhi.
4. Principles of Geographical Information Systems, by Peter A. Burrough and Rachael A. McDonnell, Oxford University Press.
5. Principles of Geographical Information Systems for Land Resources Assessment by P.A. Baurrough Oxford University Press
6. Geographical Information Systems: A Management Perspective, Stan Aromoff, WDL Publication



## REPAIR AND REHABILITATION OF STRUCTURES CE-421(c)

Course Code	CE-421(c)	L-3, T-1, P-0	
Name of the Course	Repair and Rehabilitation of Structures		
Lectures to be delivered	52 (1 Hr Each) (L = 39, P = 13 for each semester)		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)</b>			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

Aging of structures – performance of structures – need for repair and rehabilitation – Distress in concrete / steel structures, Causes of distress, Damage assessment and Evaluation models evaluation methods for condition, strength, serviceability

### SECTION B

Damage testing methods, Non Destructive testing methods, Semi destructive testing and Destructive test methods,

### SECTION C

Methods of repairs - Repair and maintenance of buildings, Repair materials, repair techniques, and quality control methods for repair of concrete, masonry, steel and timber.

### SECTION D

Retrofit techniques required in structures resulting from change in function, loading, and seismic forces, retrofit of foundations, base isolation and energy dissipation, Retrofit of Historical and heritage buildings.

### TEXT BOOKS:

1. Handbook of seismic retrofit of buildings, CPWD, IBC and IIT Madras, Narosa Publishing.
2. Seismic design, assessment and retrofitting of concrete buildings by Michael N. Fardis Springer

## **REFERENCE BOOKS:**

1. Retrofitting Design of Building Structures by Xilin Lu, CRC Press.
2. Earthquake-Resistant Structures: Design, Build and Retrofit by Mohiuddin Ali Khan Butterworth-Heinemann.
3. Concrete Structures, Materials, Maintenance and Repair, by Denison Campbell, Allen and Harold Roper, Longman Scientific and Technical UK
4. RN Raikar, Diagnosis and treatment of Structures in Distress, R and D Centre, Structural Designers and Consultants, New Bombay, India,1994.
5. VK Raina, Concrete Bridge Practice Construction, Maintenance and Rehabilitation, 2nd Edition, Shroff Publishers and Distributors, August, 2010.
6. WH Ransom, Building Failures, Diagnosis and Avoidance, 2nd Edition, E and F.N. Spon Publishers, December 1987
7. Repairs of Concrete Structures, by Allen, R.T. and Edwards, S. C., Blakie and Sons, UK
8. Maintenance and repair of Civil Structures, B L Gupta and Amit Gupta, Standard Publishers, New Delhi.
9. Handbook on Repair & Rehabilitation of RCC Buildings by Anil K Sharma ,CPWD.
10. Concrete Structures - Protection, Repair and Rehabilitation, Woodson R Dodge, Elsevier.

## ADVANCED STRUCTURAL DESIGN CE-422

Course Code	CE-422	L-3, T-1, P-0	
Name of the Course	Advanced Structural Design		
Lectures to be delivered	52 (1 Hr Each) (L = 39, P = 13 for each semester)		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**Design of water tanks:** Analysis of beams curved in plan, design of R.C.C. rectangular and circular water tanks resting on ground, design of underground tanks, design of overhead water tanks.

### SECTION B

**Design of Slabs:** Design of Ribbed slabs, Flat slabs, Introduction to Yield line theory for reinforced concrete slabs, Yield line solutions based on work equations.

### SECTION C

**Design of Plate Girders:** Introductions, Preliminary design procedure, Web penal subjected to shear, Behaviour of transverse stiffeners, Design of plate girder using IS 800 : 2007 provisions, Welding of plate girder components, Proportioning of section.

### SECTION – D

**Design of Industrial Buildings:** Selection of roofing and wall material, selection of bay width, Structural framing, Purlins, Girts and eaves strut, Plane trusses and End Bearings.

### TEXT BOOKS:

1. Advanced Reinforced Concrete design by P C Vergese, PHI Learning Pvt Ltd
2. Steel Structures Design and Practice by N Subramanian, Oxford Higher Education

### REFERENCE BOOKS:

1. N. Krishna Raju, Advanced Reinforced Concrete Design, CBS Publishers and Distributors
2. Reinforced Concrete Design by R.N. Krishna and R.N. Pranesh, New Age International (P) Limited

## WATER RESOURCES AND SYSTEM ENGINEERING CE-423

Course Code	CE-423	L-3, T-1, P-0	
Name of the Course	<b>Water Resources and System Engineering</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, P = 13 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b>	(based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		<b>Max. Marks: 50</b>

### INSTRUCTIONS:

- For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.
- For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

**Water Resources:** Surface and Ground water resources: its geographic distribution within India. Water resources development projects – purposes and planning strategies. Intra- and Inter-basin development concepts. Single- and Multi-purpose projects; Storage and Diversion schemes; Conjunctive use of surface and ground water.

### SECTION – B

**Stormwater Management & Frequency Analysis:** Urban Hydrology; Quantity and Quality Management, Issues; Detention and Retention systems, Histograms; Risk and Reliability; Frequency Distributions; Estimation of Extreme Events.

### SECTION – C

**Hydraulics of alluvial rivers:** regimes and morphology. Critical tractive force and resistance relations. Suspended, Bed and Total loads. Meandering, Braiding, Aggradation and Degradation. Routing of floods – reservoir and channel routing. Flood frequency studies, Flood forecasting.

### SECTION – D

**Managing our water resources:** Erosion control and watershed development: their benefit towards conservation of national water wealth. Rain water harnessing and recharge of ground water: role of society and people's participation for sustainable water resource development. Mitigation strategies for flood damage: structural and non-structural measures. Water distribution: Delivery strategies, Command Area Development, System of regulation and control of canal water, Outlets (modules), Assessment of canal revenue. Economics of water resources systems.

### TEXT BOOKS:

- Bedient, Philip B., and Huber, Wayne C., Hydrology and Floodplain Analysis, 2nd Edition, Addison-Wesley Publishing,
- McCuen, Richard H., Hydrologic Analysis and Design, Prentice-Hall

### REFERENCE BOOKS

- Viessman, Knapp, Lewis and Harbaugh, Introduction to Hydrology, 3<sup>rd</sup> Edition, Harper and Row Publishers, 1989.
- Ponce, Victor Miguel, Engineering Hydrology: Principles and Practices, Prentice-Hall, Inc., 1989.

## EARTHQUAKE RESISTANT DESIGN CE-424

Course Code	<b>CE-424</b>	L-3, T-1, P-0	
Name of the Course	<b>Earthquake Resistant Design</b>		
Lectures to be delivered	<b>52 (1 Hr Each) (L = 39, P = 13 for each semester)</b>		
<b>Semester End Examination</b>	Max. Time = 3 hrs.	Max. Marks: 100	Min. Pass Marks: 40
<b>Continuous Assessment</b> (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			<b>Max. Marks: 50</b>

### INSTRUCTIONS:

1. **For Paper Setters:** The question paper will consist of five sections A, B, C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C & D will have two questions from the respective sections of the syllabus. Each section will have a weightage of 20% of the total marks of the semester end examination for the course.

2. **For candidates:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in Section E.

### SECTION A

Introduction to Structural Dynamics : – Theory of vibrations – Lumped mass and continuous mass systems – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Undamped and damped free vibration – Damping – Response to harmonic excitation – Concept of response spectrum.

Multi-Degree of Freedom (MDOF) Systems : - Formulation of equations of motion – Free vibration – Determination of natural frequencies of vibration and mode shapes – Orthogonal properties of normal modes – Mode superposition method of obtaining response.

### SECTION B

Earthquake Analysis : - Introduction – Rigid base excitation – Formulation of equations of motion for SDOF and MDOF Systems – Earthquake response analysis of single and multi-storied buildings – Use of response spectra.

Codal Design Provisions : - Review of the latest Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings – Earthquake design philosophy – Assumptions – Design by seismic coefficient and response spectrum methods – Displacements and drift requirements – Provisions for torsion.

### SECTION C

Earthquake Engineering : - Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Faults – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology –Source, Focus, Epicenter etc - Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes– Seismic waves – Seismic zones – Seismic Zoning Map of India – Seismograms and Accelegrams.

Codal Detailing Provisions : - Review of the latest Indian Seismic codes IS:4326 and IS:13920 provisions for ductile detailing of R.C buildings – Beam, column and joints

## **SECTION D**

Aseismic Planning : - Plan Configurations – Torsion Irregularities – Re-entrant corners – Non-parallel systems – Diaphragm Discontinuity – Vertical Discontinuities in load path – Irregularity in strength and stiffness – Mass Irregularities – Vertical Geometric Irregularity – Proximity of Adjacent Buildings.

Shear walls : - Types – Design of Shear walls as per IS:13920 – Detailing of reinforcements.

### **TEXT BOOKS:**

1. Dynamics of Structures – Clough & Penzien, McGraw Hill – International Edition.
2. Earthquake Resistant Design of Structures – Pankaj Agarwal & Manish Shrikhande – Printice Hall of India, New Delhi

### **REFERENCE BOOKS:**

1. Dynamics of Structures by A.K.Chopra – Pearson Education, Indian Branch, Delhi.
2. Earthquake Tips by C.V.R.Murty, I.I.T. Kanpur.
3. Structural Dynamics by Mario Paaz.

**IS Codes:** IS:1893, IS:4326 and IS:13920.

## CIVIL ENGINEERING SOFTWARE LABORATORY -II CE-420(P)

<b>Course Code</b>	<b>CE-420(P)</b>	<b>L-0, T-0, P-2</b>
<b>Name of Course</b>	<b>Civil Engineering Software Laboratory -II</b>	
<b>Lectures to be delivered</b>	<b>26 (P-26, for each semester)</b>	
<b>Semester End Examination</b>	<b>MM: 25</b>	<b>Min. Marks- 10</b>
<b>Continuous Assessment</b>	<b>Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%</b>	<b>Max. Marks: 25</b>

### INSTRUCTIONS:

Laboratory examination will consist of two parts:

- (i) Performing a practical exercises assigned by the examiner.
- (ii) Viva-voce examination

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

### LIST OF EXPERIMENTS:

#### 1. Drawing using AUTOCAD SOFTWARE

Infiltration gallery (with one infiltration well, one straight gallery pipe, one inspection well and one jack well). {Practice Only}

Rapid Sand Filter,

Septic Tank with dispersion Trench/ Soak pit.

R.C.C square overhead tank supported by four columns.

R.C.C Slab Culvert with splayed wing walls.

Two span Pipe Culvert.

Two span Tee Beam Bridge with square returns.(Practice Only)

Road Over Bridge (Pile foundation, Pile Gap ,Column,

Pre cast Beams & Deck slab) – {Practice Only}

#### 2. Structural Engineering Drawings With Bar Bending Schedule

Simply supported one-way slab.

Simply supported two-way slab.

Restrained two-way slab.

Singly reinforced beam./ Doubly reinforced beam.

Tee Beams supporting continuous slab (practice only).

Dog-legged staircase.

Lintel and Sunshade (practice only)\

#### 3. STAAD PRO or Equivalent software,

EXERCISES:

3. 3-D Frame Analysis and Design

4. Retaining Wall Analysis and Design