PROGRAMME CURRICULUM

AND

SYLLABI OF

DIPLOMA PROGRAMME IN

CIVIL ENGINEERING /CIVIL(CONSTRUCTION) ENGINEERING

UNDER RATIONALISED SEMESTER SYSTEM

(IMPLEMENTED FROM ACADEMIC YEAR 2020-2021)

BOARD OF TECHNICAL EDUCATION, GOA STATE

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SYLLABUS STRUCTURE FOR CIVIL/CIVIL (CONSTRUCTION) ENGINEERING

DIPLOMA IN CIVIL (CONSTRUCTION) ENGINEERING

(GC101) Communication Skills

1. COURSE OBJECTIVE :

The course aims to develop Communication skills in English by improving students' ability to write ,speak, listen and read effectively. Emphasis is also laid on students' personality development, helping them to build their confidence in interpersonal / group communication.

2. TEACHING AND EXAMINATION SCHEME

Semester	I								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
		L	T	P	H	TH	TM	TW	PR/OR	
(GC101) Communication Skills		-	-	02	32	-	-	25	25	50

3 . COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

GC101.CO1 Understand the essentials of effective Communication.

GC101CO2 Develop reading. writing, speaking , listening and effective presentation skills.

GC101.CO3 Select the appropriate mode of Communication .

GC101.CO4 Demonstrate reading. writing, speaking , listening and effective presentation skills.

4.Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	0	0	0	0	3	3	3
CO2	1	0	1	0	3	3	3
CO3	1	0	1	0	3	3	3
CO4	1	0	0	0	3	3	3

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Phr = Practical hours**	**CO = Course Outcomes**		

Unit	**M**	**Phr**	**CO**
1 UNIT NAME: FUNDAMENTALS OF COMMUNICATION SKILLS	**-**		**CO1 CO2 CO3 CO4**
1.1 **Communication Skills fundamentals** Definition, communication process, importance of Communication Skills, essentials of effective communication		01	
1.2 **Types of communication**: verbal Communication and Nonverbal communication (Body language, facial expressions, gestures, eye contact, posture, dress and grooming/personal appearance, deportment, personal hygiene) Paralinguistic (Volume, pace, pitch, pauses)		02	
1.3 **Barriers to communication:** physical barriers, psychological barriers and cultural barriers		01	
2. Unit: PRESENTATION SKILLS			
2.1 Presentations: Methods and style of presentation, Importance, planning a presentation, venue selection, audience awareness (age, gender, profession background, educational and social background) time and duration, audio visual aids (OHP, LCD projector, flip charts, white/black/green board, computer, microphone)		**02**	**CO2 CO3 CO4**
2.2 Public speaking: preparatory steps, tips for good beginning and end, delivery style, techniques for a good speech (repetition, signs, pictures, humor), body language		**02**	
3 UNIT: TECHNICAL Writing			**CO1 CO2 CO4**
3.1 Report **writing** Functions and parts of a report, Qualities of a good report, and types: Report on any institute function, Accident report, Industrial visit Report		04	

3.**2 Business letters** Principles of effective letter writing, parts of a business letter, formats (Full block style, Semi block style, modified block style) Routine/ Generic letters (letter to the heads of the institute, letter to the heads of various departments/sections of the institute) Types of letters: Enquiry Letter, Quotation, Purchase Order, Letter of Complaint		06	
3.3 **Job application** Tips for a good C.V and a Resume		02	
4 UNIT GRAMMAR	-		
4.1 Fundamentals of English writing Subject verb agreement, homonyms, homophones, homographs, articles, Punctuation, synonyms, fundamentals of sentence construction		**02**	**CO1** **CO2** **CO4**
4.2 Paragraph Writing: Developing Topics (the main idea), body (supporting sentences), conclusion, proof reading		**02**	
UNIT V: LANGUAGE WORKSHOP **5.1 Reading Skills** strategies to use for building vocabulary and reading fluencies (read extensively, identify new words, use of dictionary, online dictionary apps), reading comprehension, pronunciation, debate, role play,	-	08	**CO1** **CO2** **CO4**
5.2 Listening Skills How to listen effectively, listening comprehension			
5.3 Speaking skills speech, group discussion			
5.4 Writing skills précis writing, comprehension			
Total		**32**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, videos, exercises

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	NO of lectures	Marks
1	Fundamental of Communications skills	04	-
2	Presentation Skills	04	-
3	Technical Writing	12	-
4	Grammar	04	-
5	Language workshop	08	-
	Total	32	25

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical
1.	**Practical Title: Fundamental of Communications skills**
i.	Comprehension
ii.	Précis writing
iii.	Self-Introduction
2	**Practical Title: Presentation Skills**
iv.	Extempore speech
v.	Presentation on any given Topic
3	**Practical Title: Technical Writing**
vi.	Accident Report
vii.	Report on Institute function
viii.	Industrial visit report
ix.	Generic letters to the heads of various department/ Sections of the institute
x.	Inquiry letter
xi.	Quotation
xii.	Purchase or supply order
xiii.	Complaint letter
xiv.	Job application
4	**Grammar**
xv.	Exercises in subject – verb agreement
xvi.	Exercises in use of preposition
xvii.	Exercises in use of Homophones, homonyms, homographs
xviii.	Exercises in use of punctuation
xix.	Exercises relating to correcting the sentences
xx.	Paragraph writing
5	**Language workshop**
xxi.	Exercises to improve Reading skills
xxii.	Exercises to improve Writing skills
xxiii.	Group discussion
xxiv.	Listening comprehension

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R. C. Sharma & Krishna Mohan	Business Correspondence and Technical Writing	Tata McGraw Hill
2	P. Prasad, Sharma, K. Rajendra	The Functional aspects of communication skills	S.k. Kataria& sons
3	SanjayKumar,Pushpa Lata	Communication Skills	Oxford University Press
4	A.K.Jain,A.M.Shaikh&Pravin S R Bhatia	Professional communication Skills	S.Chand
5	Wren & Martin	High School English Grammar & Composition	S. Chand, N. Delhi

10.Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Raul R. Timm	How to make winning presentations	Sneha Printers
2	Dale Carnegie, Training CPI	Stand and Deliver, How to become a masterful communicator and public speaker	Cox & Wyman, UK
3	John Seely	The Oxford Guide to Effective Writing and speaking	Oxford University Press

Autobiographies, self-help books, Audio speeches given by famous personalities

Internet and Web Resources

https://www.grammarly.com/
https://www.bbc.co.uk/programmes/articles/5QFnVy3xzT5htTh13cmP2P8/teacher-resources
https://Ted.com

Videos and Multimedia Tutorials

https://you.tu.be/AykYRO5d_II

(GC102) Engineering Mathematics I

1. COURSE OBJECTIVE:

1. The course is aimed at providing mathematical knowledge, developing computational skills and reasoning. It also helps students to think logically and in systematic manner so as to grasp mathematical concepts easily. It helps to build analytical thinking which play an important role in solving real world problems in all scientific discipline.

2.TEACHING AND EXAMINATION SCHEME

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total hours**	**Examination Scheme**			
						Theory Marks		**Term Work**	**Total Marks**
(GC102) Engg.Maths I		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	
		4	**2**	**-**	**96**	**75**	**25**	**25**	**125**

3.COURSE OUTCOMES:

GC102.CO1. Understand the basic mathematical concepts for Engineering applications.

GC102.CO2. Identify and use appropriate formulae for solving practical engineering problems

GC102.CO3. Apply formulae of algebra, geometry, trigonometry and calculus for solving problems.

GC102.CO4 . Co-relate mathematical formulae to practical problems.

4.Mapping Course Outcomes with Program Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CO1	**3**	**2**	**1**	**0**	**0**	**0**	**2**
CO2	**3**	**3**	**1**	**0**	**1**	**0**	**1**
CO3	**2**	**2**	**3**	**3**	**2**	**0**	**1**
CO4	**2**	**3**	**3**	**2**	**1**	**1**	**1**

Relationship :Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**	

Unit	**Marks**	**Thr**	**CO**
1 MATHEMATICS FUNDAMENTAL	**8**	**6**	**CO1**
1.1 **Polynomials: Types** of polynomials, addition subtraction, (no question to be asked), Multiplication and division of polynomials	3	2	
1.2 **: Algebraic equations:**Different types of equations and their geometric meaning(line,circle parabola only) ,equations with one, two and three variables and solving equations with two and three variables Quadratic equations and nature of their solutions	3	2	
1.3: Logarithm: Definition of log, log with base 'e' and base'10' Properties of log, log and antilog , problems using definition and properties of log.	2	2	
2.STRAIGHT LINES AND CIRCLES	15	14	**CO1, CO4**
2.1: Straight line: Intercept, slope, intersection of lines Equations of line: 1. Slope intercept form, slope point form, two points form, parallel and perpendicular lines, angle between lines Perpendicular distance of a point from line	8	7	
2.2: Circle: circle as a locus, Centre, diameter, chord of a circle Equations of circle: Centre radius form, diameter form, general form and sums	7	7	
3. TRIGONOMETRY			**CO1, CO3**
3.1: Angle and measurement, degree and radians and conversion and related sums, arc length and area of sector and sums **3.2:** Trigonometric ratios and identities 3.3: Trigonometric ratios of compound and allied angles 3.4: Product formulae sinA$\pm$sinB, cosA$\pm$cosB **3.5:** Sum and difference formulae **3.6:** Multiple angle 2A, and their trigonometric ratios, **3.7**: Sine rule, Cosine rule in triangle, solution of triangle	12	15	

4 : MENSURATION	10	6	**CO1, CO4**
4.1: Areas of 2D figures like quadrilaterals, circle triangle etc (no questions to be asked) **4.2:** Surface area and volumes of cube, sphere, cylinder, cone, (no question to be asked) Surface areas and volumes of prism, pyramid, **4.3**: Frustum of cone, pyramid and their surface areas and volumes. **4.4:** Simpson's 1/3 rd rule for area and volume			
5 :CALCULUS	30	23	**CO1, CO2, CO3, CO4**
5.1:Limits 5.1.1 : Pre requisite : Sets , intervals, relation and function (no questions to be asked) 5.1.2 : Limit of a function , algebraic properties of limits 5.1.3: Limits of algebraic, trigonometric, exponential, logarithmic functions	7	6	
5.2 : Derivatives 5.2 .1: Derivative definition by first principle (no question to be asked) 5.2.2: Standard formulae, Algebraic properties of derivative (u±v) etc. 5.2.3: Derivatives of algebraic, trigonometric, exponential, logarithmic functions 5.2.4: Derivative of product of functions (uv rule). 5.2.6: Derivative of quotient of functions (u/v rule) 5.2.7: Derivative of composite functions 5.2.8: Derivative of parametric functions 5.2.9: Derivative of implicit functions 5.2.10 : Logarithmic differentiations 5.2.11: Second order derivatives (no question to be asked)	15	12	
5.3 : Applications of derivatives 5.3.1: Application to the geometry: i) derivative as a slope of a tangent ii) to find equations of tangent and normal at given point on the curve 5.3.2: Application to the Linear motion:i) displacement, velocity,acceleration 5.3.3: Application to the rate measure i) to find rate change in area and volume etc 5.3.4 : Maxima and minima	8	5	
Total	**75**	**64**	

6. COURSE DELIVERY:
The Course will be delivered through lectures, class room interactions, exercises

7. SPECIFICATION TABLE FOR THEORY

Unit No	Unit	Number of lectures	Marks
1	**Mathematics Fundamental**	06	8
2	**Straight line and circle**	14	15
3	**Trigonometry**	15	12
4	**Mensuration**	06	10
5	**Calculus**	23	30
	Total	**64**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

- Tutorial books should be maintained by students (5 marks)
- Two home assignments per semester (5 marks)

  The Two assignments each comprises of thirty questions which includes 15 short questions and fifteen long questions. First assignment will cover fifty percent of syllabus

  and second assignment will cover remaining portion of syllabus

- Topic-wise class assignment (15 marks)

  Class assignment comprises of ten short and ten long questions.

9. LEARNING RESOURCES

Text Books

S. No.	Title of Books	Author	Publishers
1	Mathematics for Polytechnic Students(Basic Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
2	Mathematics for Polytechnic Students(Engineering Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
3	S.B. Gore, M.B.Patil, S.P. Pawar	Applied Mathematics	Vrinda Publications

Reference Books for further study

S. No.	Title of Books	Author	Publishers
1	Applied Mathematics I	Dr. U.B.Jangam, K.P. Patil, Nalini Kumthekar	Nandu Printers& Publishers pvt. Ltd. Mumbai
2	Applied Mathematics for Polytechnics	H.K. Dass	CBS Publishers and distributers Pvt.Ltd. ,Pune
3	Set Theory and related topics	Seymour Lipschutz	McGraw-Hill

(GC103) APPLIED PHYSICS-I

1.COURSE OBJECTIVE :

On successful completion of the course, Students completing the Applied Physics I course will be able to demonstrate competency and understanding of the basic concepts found in, Units and Dimensions, Kinematics of motion in one dimension Force Work Power and Energy, Circular Motion and Gravitation, Properties of Matter and Heat and will be able to utilize the knowledge to demonstrate competency with experimental methods that are used to discover and verify the concepts related to content knowledge

2.TEACHING AND EXAMINATION SCHEME

Semester	I									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
(GC103) Applied Physics I		L	T	P	H	TH	TM	TW	PR/OR	
		03	0	02	80	75	25	25	-	125

3.COURSE OUTCOMES:

GC103.CO1: Understand the Fundamental concepts of physical quantities, Force, Power, Energy, Motion, Matter and heat transfer used in Engineering applications.

GC103.CO2: Explain the concepts of Dimensions, Work, Power , Energy ,Motion, properties of matter and heat transfer

GC103.CO3: Apply the Knowledge of Physical quantities, Types of motions, Force, work ,Power, properties of matter and heat transfer in Engineering applications

GC103. CO4: Analyze different types of Physical quantities, motions, properties of matter, and modes of heat transfer

4. Mapping Course Outcomes with Program Outcomes

Relationship: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	**Problem Analysis**	**Design and Devlopment of Solutions**	**Engg. Tools, Experimentatn& Testing**	**Engg. Practices for Society,Sustainability& Environment**	**Project Management**	**Life -long Learning**
CO 1	3	1	1	3	2	0	3
CO 2	3	1	2	3	0	0	3
CO 3	3	1	2	2	0	1	1
CO 4	1	1	2	2	0	1	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Outcomes**			
Unit	**Thr**	**M**	**CO**
1 UNIT NAME: UNITS AND DIMENSIONS	**08**	**12**	**CO1, CO2, CO3, CO4**
1.1 Fundamental and Derived units ,			
1.2 Different system of units, SI unit conversion from one system to other,			
1.3 Principle of Homogeneity,			
1.4 Dimensions, dimensional formula,			
1.5 dimensonal correctness of given equation using dimensions			
1.6 least count of vernier calliper and screw gauge			
1.7 zero errors-- in case of vernier calliper and screw gauge			
1.8 Types of error.			
2. UNIT NAME: MOTION IN ONE DIMENSION, FORCE, WORK,POWER AND ENERGY	**10**	**16**	**CO1, CO2, CO3, CO4**
2.1 Distance and displacement,			
2.2 Scalar and Vectors			
2.3**,** Speed and Velocity, Uniform Velocity, ,			
2.4 Uniform acceleration,acceleration due to gravity			
2.5 Equation of motion ($v=u+at$, $v^2=u^2+2as$, $s=ut+1/2at^2$)(no derivation)			
2.6 Motion under gravity. Force and its unit.			
2.7 Work and its unit. Energy, law of conservation of energy,			
2.8. Kinetic and Potential energy equation and examples.			
3. UNIT NAME: Uniform Circular Motion and Gravitation	**10**	**16**	**CO1, CO2, CO3, CO4**
3.1 Unifrom circular motion,			
3.2 Definition angular displacement,angular velocity, ,			
3.3 Conversion from rpm to rad/sec,$v=r\omega$, tangential velocity, radial acceleration			
3.4 Centripetal force and centrifugal force, examples,			
3.5 Banking of roads,superelevation, expression for angle of banking			
3.6 Newtons law of gravitation, acceleration due to gravity ,			
3.7 Expression for acceleration due to gravity. Escape velocity, Critical velocity, and periodic time definition and expression (no derivation)			
3.8. Sattellite, types(Geosationary,communication remote sensing)			
4. UNIT NAME: PROPERTIES OF MATTER	**10**	**16**	**CO1, CO2, CO3, CO4**
4.1 Elasticity ,			
4.2 Stress, Strain,Hooke's law,			
4.3 Youngs Modulus,			
4.4 Bulk Modulus, Rigidity Modulus,			
4.5 Stress v/s Strain graph			
4.6 Yield point, breaking stress,factor of safety, ,			
4.7 Surface tension definition and example			
4.8. Adhesive and cohesive force, application,			
4.9 liquid miniscus and angle of contact, capillarity,			
4.10 Expression for surface tension (no derivation), applications. viscocity,			

4.11 Definition velocity gradient, newtons law of viscocity, terminal velocity,stokes law,			
4.12 Streamline flow and turbulent flow,critical velocity, application of viscocity.			
5. UNIT NAME: HEAT	**10**	**15**	**CO1, CO2, CO3, CO4**
5.1 Statements of boyles law,charles law,gay lussacs law			
5.2 General gas equation,specific heat definition and unit, Latent heat definition and unit			
5.3 Modes of transfer of heat, conduction, convection and radiation,			
5.4 Conduction of heat through a metall rod,			
5.5 Variable and Steady state			
5.6 law of thermal conductivity (With Derivation)			
5.7 Applications of thermal conductivity, ,			
5.8. Thermal expansion of solids			
5.9 linear expansion,superficial expansion,			
5.10 Cubical Expansion			
5.11 Realtion betwenn α,β,γ (no derivation)			
5.12 Engineering applications of expansion of solids.			

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	UNITS AND DIMENSIONS	8	12
2	MOTION IN ONE DIMENSION, FORCE, WORK AND ENERGY	10	16
3	UNIFORM CIRCULAR MOTION AND GRAVITATION	10	16
4	PROPERTIES OF MATTER	10	16
5	HEAT	10	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS

No	Practicals	Marks
1.	Basic Conversion Techniques from one system of units to the other	25
2.	Use of Vernier callipers to find the Volume of Hollow cylinder, Block	25
3.	Use of Screw gauge to find the cross-sectional area of a wire and thickness of a clip	25
4.	To find the Coefficient of Viscosity of a given liquid by stokes method	25
5.	To Find the coefficient of Thermal Conductivity by Searle's Method	25
6	To Find the Surface Tension of a given liquid by capillary rise method	25
7	To Find Young's Modulus by Searles Method	25
8	To Find acceleration due to gravity by simple pendulum method.	25
	Total (Average)	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B G Dhande	Applied Physics of Polytechnics	Pune Vidyarthi Griha Prakashan
2	Bhandarkar	Applied Physics of Polytechnics	Vrinda publication
3	R K Gaur and S L Gupta	Engineering Physics	Dhanpat Rai & Sons Delhi
4	Dr. Vasudev R Bhagwat	A Text Book of Applied Physics for Polytechnics	Broadway Publishing House
5	B L Thereja	Engineering Technology	S. Chand

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Halliday D and Resnick	Physics Part I-II	Wiley Eastern Ltd.
2	Satish k. Gupta	ABC of Physics I&II	Modern Publisher
3	Saxena HC and Singh Prabhakar	Applied Physics Vol I & II	S. Chand Publisher

(GC104) Applied Chemistry

1. COURSE OBJECTIVE:

Chemistry is the branch of Science which deals with the study of composition, properties and changes in matter. An understanding of the basic concepts of Applied Chemistry, chemical principles and chemical properties of materials is essential to all the engineers. The emphasis is on applying the knowledge of principles of chemistry in all the fields of engineering wherein students appreciate the significance of chemistry in day to day life. The subject develops in students the habit of scientific enquiry, the ability to investigate cause and effect relationship & the ability to interpret & analyze the results.

2. TEACHING AND EXAMINATION SCHEME

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits (Hours)**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GN104) Applied Chemistry		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**-**	**2**	**80**	**75**	**25**	**25**	**-**	**125**

3. COURSE OUTCOMES:

GC 104.CO1: Understand the fundamental concepts of Atomic Structure, electrochemistry, water quality, corrosion and polymers.

GC 104.CO2: Explain the process of Chemical bonding, water softening, electroplating, corrosion control and polymerization

GC 104.CO3: Relate the principles of Chemical Bonding, Electrolysis, water hardness for domestic and Industrial applications and properties of polymers.

GC 104.CO4: Distinguish between types of Chemical bonding, Water softening methods, corrosion control methods, different processes of metal coating and different polymers.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimenting& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	3	2	1	1	2	1	1
CO2	2	3	2	1	3	1	2
CO3	3	2	2	2	3	1	2
CO4	3	2	2	2	2	1	1

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**Mks**	**Thr**	**CO**
UNIT 1.0 : ATOMIC STRUCTURE AND CHEMICAL BONDING	**15**	**10**	CO1 CO2 CO3 CO4
1.1 Atomic Structure 1.1.1 Fundamental particles and their characteristics. 1.1.2 Energy levels - Definition & designation 1.1.3 Sub Energy levels- Definition & designation 1.1.4 Orbital – Concept & shape (s and p only) **1.2** Quantum numbers 1.2.1 Designation, definition, values.			
1.3 Electronic distribution (Elements from atomic Number 1-20) 1.3.1 Bohr – Bury's laws for distribution of electrons in shells (1st three laws only) 1.3.2 Aufbau Principle. for distribution of electrons in sub-shells 1.3.3 Pauli's Exclusion Principle. 1.3.4 Hund's Rule of maximum multiplicity 1.3.5 Orbital Electronic Configuration of elements (from atomic numbers 1 to 20 only).			
1.4 Chemical Bonding 1.4.1 Lewis and Longmuir concept of stable configuration. 1.4.2 Electrovalent - Bond - Concept Formation of Electrovalent Compound (NaCL & MgO) 1.4.3 Covalent Bond – Concept Formation of Colvalent Compounds (Cl_2, O_2, N_2) 1.4.4 Co-ordinate Bond - Concept Formation of Co-ordinate Compounds (O_3) 1.4.5 Properties of Electrovalent, Colvalent & Co-Ordinate compounds.			
UNIT 2.0 : WATER	**15**	**10**	CO1 CO2 CO3 CO4
2.1 Hardness of Water 2.1.1 Soft and Hard Water - Concept Soap Test (Chemical Equation not expected) 2.1.2 Causes of Hardness 2.1.3 Types of Hardness 2.1.4 Degree of Hardness & Units of Hardness (mg/L & ppm)			
2.2 Disadvantages of Hard Water 2.2.1 Domestic Purpose Drinking, cooking, Washing & Bathing.			

2.2.2 Industrial Purpose (Paper Industry, Textile & Dyeing Industry, Sugar Industry, Bakery & Concrete Making) 2.2.3 Boilers- Steam Generation Purpose. Sludge formation – causes & Disadvantages (No chemical equation expected)			
2.3 Water Softening 2.3.1 Zeolite and Ion Exchange process of water softening			
2.4 Desalination of water 2.4.1 Electrodialysis & Reverse Osmosis process. 2.4.2 pH- Concept, pH scale & Importance of pH			
UNIT 3.0 : <u>ELECTROCHEMISTRY</u>	**12**	**08**	CO1 CO2 CO3 CO4
3.1 Electrolytic dissociation 3.1.1 Arrhenius theory of Electrolytic dissociation 3.1.2 Factors affecting degree of Ionization- nature of solute, nature of solvent, concentration of solution and temperature.			
3.2 Electrolysis 3.2.1 Mechanism of Electrolysis. Ionization Reactions Reactions at cathode, Activity series of Cations. Reactions at Anode, Activity series of Anions. 3.2.2 Electrolysis of Molten NaCl using Carbon Electrodes. Aqueous NaCl using Platinum Electrodes. Aqueous $CuSO_4$ using Platinum Electrodes. Aqueous CuSO4 using copper Electrodes.			
3.3 Electrochemical series – Definition and Significance			
UNIT 4.0 : CORROSION AND ITS CONTROL	**25**	**14**	CO1 CO2 CO3 CO4
4.1 Dry /Direct Chemical corrosion 4.1.1 Definition 4.1.2 Oxidation corrosion 4.1.3 Corrosion due to other gases.			
4.3 Types of Electrochemical corrosion. 4.3.1 Galvanic Cell corrosion 4.3.2 Concentration cell corrosion(Metal ion concentration & differential Aeration)			

4.4 Corrosion Control Protection of metals by: 4.4.1. Using Pure Metals & Metal alloys 4.4.2 Proper designing 4.4.3 Modifying the environment (De- aeration, Deactivation, Dehumidification, Alkaline neutralization) 4.4.4 Cathodic protection (Sacrificial anode and Impressed current cathodic protection) 4.4.5 Metal Coating (Galvanizing, Tinning, Metal-Spraying, Electroplating & powder coating)			
UNIT 5: POLYMERS	**08**	**06**	CO1 CO2 CO3 CO4
5.1 Concept of Monomers & Polymers **5.2**Polymerization- Definition. 5. 2.1 Addition polymerization-Definition. 5.2.2 General equation of polymerization of :- Ethylene to Polyethylene. Vinyl chloride to Polyvinylchloride Tetra fluoro ethylene to Poly tetra fluoroethylene(PTFE) 5.2.3 Condensation Polymerization-Definition 5.2.4 General Equation for formation of Phenol formaldehyde Resin. **5.3** Plastics. 5.3.1 Types of plastic (Thermosetting and Thermo softening), Examples 5.3.2 Properties and applications of Poly-ethylene, PVC, polystyrene, Nylons, Bakelite & silicones.			
5.4 Rubber 5.4.1 Natural Rubber 5.4.2 Drawbacks of Crude rubber. 5.4.3 Vulcanization of Rubber (General Equation) 5.4.4 Rubber examples. 5.4.5 Properties of Synthetic Rubber & related applications.			

8. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

9. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**ATOMIC STRUCTURE AND CHEMICAL BONDING**	10	15
2	**WATER**	10	15
3	**ELECTROCHEMISTRY**	08	12
4	**CORROSION & IT'S CONTROL**	14	25
5	**POLYMERS**	06	08

	Total	**48**	**75**

10. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	**Practical**
	Practical Title
1.	Double Acid-Base Titration using Phenolphthalein.
2.	Acid- Base titration using Methyl orange.
3.	Redox Titration of $KMnO_4$ soln., $FeSO_4$ soln. and Oxalic acid
4.	Determination of degree of Hardness by E.D.T.A method.
5.	Determination of Total Alkalinity of water sample.
6.	Determination of Chloride content of water sample by Mohr's method.
7.	pH- Metric titration.
8.	Conduct metric Titration.
9.	Determination of Conductivity of water samples from different water body sources.
10.	Corrosion Susceptibility of Aluminum to Acid or Base.
11.	Determination of pH of different food items.
	Total Marks: 25
	No Class room Assignments

*** Any TEN of the above.**

****Term Work Assessment Scheme**:1. Performance:15 marks (Carrying out experiment, Readings, Calculations and Results)
2.Knowledge :05 Marks(Theory of the experiment)
3. Journal : 05 Marks

11. LEARNING RESOURCES

Text Books

S. No.	**Author**	**Title of Books**	**Publishers**
1	M.M. Uppal	Text book of Engg. Chemistry	Khanna Publisher
2	V.P.Mehta	Text book of Engg. Chemistry	Jain Bros. Delhi
3	S.N Narkhede	Textbook of Engg. Chemistry	Niraj Prakashan
5	S S Dara	A Textbook of Engg. Chemistry	S Chand & Co
4	P.C. Jain and M.Jain	Engg. Chemistry.	Dhanpat Rai Publishing Co.

(GC105) Basic Engineering Practice (Electronics& Comp.)

1. COURSE OBJECTIVE:

The students will be able to acquire knowledge about safety aspects, firefighting, first-aid and carpentry, fitting, plumbing skills. The students will learn proper ways of using various hand tools, measuring devices in acquiring these skills and will also interpret simple electrical drawings/circuit diagrams.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(GC 106)	L	T	P	H	TH	TM	PR/OR	TW	
Basic Engineering Practice	0	0	5	80	-	-	50	100	150

3. COURSE OUTCOMES:

PART A

On successful completion of the course, the student will be able to:
GC106.CO1. Understand safety procedures to be followed in carpentry, fitting, and plumbing.
GC106.CO2. Identify various tools used for carpentry, fitting, and plumbing.
GC106.CO3: Demonstrate basic working skills in carpentry, fitting and plumbing.

GC106.CO4: Plan & execute a job/activity using job drawing.

PART B

On successful completion of the course, the student will be able to:
GC106.CO1. List the safety measures.to be observed in electrical workshop.
GC106.CO2. Identify various electrical tools, fittings used for electrical measurements & troubleshooting.
GC106.CO3: Distinguish between single phase and three phase supply.

GC106.CO4: Plan & execute a job/activity from electrical circuit drawing.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

PART A

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	2	1	1	3	2	2	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-3

PART B

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	3	1	1	2	2	1	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Hr = Practical Hours**	**CO = Course Outcomes**			
Unit			**M**	**Hr**	**CO**
1 General Safety, Housekeeping, Fire Fighting & First Aid			10	06	
1.1Introduction to General Safety aspects of engineering workshop 1.2 Meaning and importance of housekeeping. 1.3 Fire hazards, fire triangle, types of fire extinguishers – selection and use. 1.4Basic knowledge of first aid with specific inputs on cuts, burns, electric shocks, artificial respiration, handling emergencies.					CO1
2 Fitting Workshop Practice			30	18	
2.1 Introduction to the trade.					CO1

2.2 Introduction to various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools 2.3 Types of files and filing methods. 2.4 Drill bits and drilling Processes, using portable and pillar drilling machine. 2.5 Operations performed in fitting shop such as measuring, marking, chipping, filing, grinding, sawing, drilling 2.6 Threading using taps and dies.			CO2 CO3
3 Carpentry Workshop Practice	20	18	
3.1 Introduction to carpentry 3.2 Types of wood and its characteristics, forms of wood, defects in timber and its identification, wood working hand tools 3.3 Wood working processes. 3.4 Different types of joints and their usage. 3.5 Introduction to wood working machines: 3.6 Lathe 3.7 Circular saw 3.8 Band saw 3.9 Wood planner 3.10 Universal wood working machine			CO1 CO2 CO3
4 Electrical Workshop Practice	30	32	
4.1 Brief introduction to power distribution and Electrical Safety. 4.2 Use of different hand tools used in electrical trade 4.3 Collection of details of motors and transformers. 4.4Introduction to Control Panel and its various sections/components. 4.5 Making of wire joints. 4.6Measurement of current, voltage, frequency and Power Consumption. 4.7 Connecting and starting of Induction Motor & Measurement of its speed. Changing of Direction of rotation of induction motor. 4.8 Introduction to commonly used electrical Fittings (Domestic & Industrial). 4.9Wiring of Simple Electric Circuit (Bulb & plug point and switches) on wooden board 4.10 Study, connection & use of Energy Meter 4.11Testing of components using Series test lamp & Multimeter 4.12Study of Fuses & practice replacement of Fuse 4.13 Study & Troubleshooting of Tube Light			CO1 CO2 CO3 CO4
5 Plumbing	10	06	
5.1Plumbing tools, pipe fittings and method of joining pvc pipes. 5.2 Use of spirit level and plumb bob. 5.3 Minor repairs and replacement of fittings. 5.4 Reading of plumbing drawings. *[Note: Plumbing restricted to domestic plumbing and pvc piping.]*			CO1 CO2 CO3
Total	**100**	**80**	

6. COURSE DELIVERY:

The Course will be delivered through workshop practical sessions in mechanical and electrical workshops.

7. SPECIFICATION TABLE FOR PRACTICALS/ MACRO-LESSON PLAN

Unit No	Unit	Number of hrs.	Marks
1	General Safety, Housekeeping, Fire Fighting & First Aid	06	10
2	Fitting Workshop Practice	18	30
3	Carpentry Workshop Practice	18	20
4	Electrical Workshop Practice	32	30
5	Plumbing	06	10
	Total	80	100

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Hrs.
1	**General Safety, Housekeeping, Fire Fighting & First Aid**	**06**
a	Demonstration on use of Safety Measures while working in Workshop and use of safety signs.	03
b	Demonstration on use of First Aid and Artificial Respiration procedure ,Training on fire and emergency services (using video presentation /fire and safety expert talk)	03
2	**Fitting Workshop Practice**	**18**
a	Identification of various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools	03
b	Identification of various types of files and demonstration on filing methods.	03
c	Identification of various types of Drill bits, taps, dies and Drilling machines such as portable and Pillar Drilling machine.	03
d	Job involving filing, marking, cutting operation on MS Flat.	06
e	Job involving Drilling and Tapping operation on MS flat.	03
3	**Carpentry Workshop Practice**	**18**
a	Identification of various types of woods and wood working hand tools	03
b	Identification of various types of Carpentry joints and their usage.	03
c	Introduction to wood working machines such as wood working Lathe, Circular saw ,Band saw, Wood planner, Universal wood working machine	03
d	Job involving marking, measuring, planning, sawing, chiseling, joint preparation and assembly of wooden blocks.	06
e	Preparation of job on wood working lathe.	03
4	**Electrical Workshop Practice**	**32**
a	Measurement of Single Phase and Three Phase supply Voltage using multimeter.	02
b	Identification of various hand tools used in electrical trade.	02
c	Measurement of electric circuit parameters using Ammeter, Voltmeter,	04

	Frequency meter, Wattmeter.	
d	Making of Straight and T wire joints.	02
e	Testing of electrical components such as Choke, starter, Fuse, Switch using Series Test lamp and Multimeter	02
f	Starting of induction motor using DOL Starter	02
g	Reversal of direction of rotation of Three phase induction motor	02
h	Identification of commonly used electrical fittings.	02
i	Wiring of simple electrical circuit using bulb and socket.	04
j	Measurement of Energy using Energy Meter.	02
k	Identification of Different types of Fuses and their replacement in circuit.	02
l	Testing of various components and connection of Tube light circuit.	02
m	Collecting Name plate Details of Motors and Transformers and operating and controlling speed of motor from Control panel.	04
5	**Plumbing**	**06**
a	Identification of Plumbing tools and pipe fittings , Reading of plumbing drawings, methods of joining PVC pipes, use of spirit level and plumb bob in piping.	03
b	To carry out minor repairs and replacement of fittings.	03

9. LEARNING RESOURCES

TEXT BOOKS

S. No.	Author	Title of Books	Publishers
1	N. Sesha Prakash	Manual of Fire Safety	CBS Publishers and Distributers
2	S.K. Hajara-Chaudhary	Workshop Technology	Media Promoters
3	B.S. Raghuwanshi	Workshop Technology-	Dhanpat Rai and sons, New Delhi
4	R K Jain-	Production Technology	Khanna Publishers, New Delhi
5	H. S .Bawa	Workshop Technology	Tata McGraw Hill Publishers, New Delhi
6	Kent	Mechanical Engineering Hand book	John Wiley and Sons, New York
7	B.L. Theraja	Fundamentals of Electrical Engineering and Electronics	S. Chand – New Delhi

REFERENCE BOOKS FOR FURTHER STUDY

S. No.	Author	Title of Books	Publishers
1	CIMI- Central Instructional Media Institute Madras	Turner – Trade Theory – Ist and IInd Year	Wiley Eastern Ltd. New Delhi

(GC106) Basic Engineering Practice (Mech & Elect.)

2. COURSE OBJECTIVE:

The students will be able to acquire knowledge about safety aspects, firefighting, first-aid and carpentry, fitting, plumbing skills. The students will learn proper ways of using various hand tools, measuring devices in acquiring these skills and will also interpret simple electrical drawings/circuit diagrams.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(GC 106)	L	T	P	H	TH	TM	PR/OR	TW	
Basic Engineering Practice	0	0	5	80	-	-	50	75	125

3. COURSE OUTCOMES:

PART A

On successful completion of the course, the student will be able to:
GC106.CO1. Understand safety procedures to be followed in carpentry, fitting, and plumbing.
GC106.CO2. Identify various tools used for carpentry, fitting, and plumbing.
GC106.CO3: Demonstrate basic working skills in carpentry, fitting and plumbing.

GC106.CO4: Plan & execute a job/activity using job drawing.

PART B

On successful completion of the course, the student will be able to:
GC106.CO1. List the safety measures.to be observed in electrical workshop.
GC106.CO2. Identify various electrical tools, fittings used for electrical measurements & troubleshooting.
GC106.CO3: Distinguish between single phase and three phase supply.

GC106.CO4: Plan & execute a job/activity from electrical circuit drawing.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES

PART A

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	2	1	1	3	2	2	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-3

PART B

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	1	3	2	2	3
CO2	2	1	2	3	2	2	2
CO3	3	1	1	2	2	1	2
CO4	2	1	3	3	2	3	2

Relationship: Low-1 Medium-2 High-

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Hr = Practical Hours** | **CO = Course Outcomes**			
Unit	**M**	**Hr**	**CO**
1 General Safety, Housekeeping, Fire Fighting & First Aid		06	
1.1Introduction to General Safety aspects of engineering workshop 1.2 Meaning and importance of housekeeping. 1.3 Fire hazards, fire triangle, types of fire extinguishers – selection and use. 1.4Basic knowledge of first aid with specific inputs on cuts, burns, electric shocks, artificial respiration, handling emergencies.			CO1
2 Fitting Workshop Practice		18	
2.7 Introduction to the trade. 2.8 Introduction to various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools 2.9 Types of files and filing methods. 2.10 Drill bits and drilling Processes, using portable and pillar drilling machine. 2.11 Operations performed in fitting shop such as measuring, marking, chipping, filing, grinding, sawing, drilling 2.12 Threading using taps and dies.			CO1 CO2 CO3
3 Carpentry Workshop Practice	20	18	
3.10 Introduction to carpentry 3.11Types of wood and its characteristics, forms of wood, defects in timber and its identification, wood working hand tools 3.12 Wood working processes. 3.13 Different types of joints and their usage. 3.14 Introduction to wood working machines: a. Lathe b. Circular saw c. Band saw d. Wood planner e. Universal wood working machine			CO1 CO2 CO3
4 Electrical Workshop Practice	30	32	
4.1 Brief introduction to power distribution and Electrical Safety. 4.2 Use of different hand tools used in electrical trade 4.3 Collection of details of motors and transformers. 4.4 Introduction to Control Panel and its various sections/components. 4.5 Making of wire joints. 4.6Measurement of current, voltage, frequency and Power Consumption. 4.7 Connecting and starting of Induction Motor & Measurement of its speed. Changing of Direction of rotation of induction motor. 4.8 Introduction to commonly used electrical Fittings (Domestic & Industrial).			CO1 CO2 CO3 CO4

4.9Wiring of Simple Electric Circuit (Bulb & plug point and switches) on wooden board 4.10 Study, connection & use of Energy Meter 4.11Testing of components using Series test lamp & Multimeter 4.12Study of Fuses & practice replacement of Fuse 4.13 Study & Troubleshooting of Tube Light			
5 Plumbing		06	
5.1 Plumbing tools, pipe fittings and method of joining pvc pipes. 5.2 Use of spirit level and plumb bob. 5.3 Minor repairs and replacement of fittings. 5.4 Reading of plumbing drawings. *[Note: Plumbing restricted to domestic plumbing and pvc piping.]*			CO1 CO2 CO3
Total		**80**	

6. COURSE DELIVERY:

The Course will be delivered through workshop practical sessions in mechanical and electrical workshops.

7. SPECIFICATION TABLE FOR PRACTICALS/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of hrs.**	**Marks**
1	General Safety, Housekeeping, Fire Fighting & First Aid		10
2	Fitting Workshop Practice		30
3	Carpentry Workshop Practice		20
4	Electrical Workshop Practice		30
5	Plumbing		10
	Total		100

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	**Practical**	**Hrs.**
1	**General Safety, Housekeeping, Fire Fighting & First Aid**	**06**
a	Demonstration on use of Safety Measures while working in Workshop and use of safety signs.	03
b	Demonstration on use of First Aid and Artificial Respiration procedure ,Training on fire and emergency services (using video presentation /fire and safety expert talk)	03
2	**Fitting Workshop Practice**	**18**
a	Identification of various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools	03
b	Identification of various types of files and demonstration on filing methods.	03
c	Identification of various types of Drill bits, taps, dies and Drilling machines such as portable and Pillar Drilling machine.	03
d	Job involving filing, marking, cutting operation on MS Flat.	06

e	Job involving Drilling and Tapping operation on MS flat.	03
3	**Carpentry Workshop Practice**	**18**
a	Identification of various types of woods and wood working hand tools	03
b	Identification of various types of Carpentry joints and their usage.	03
c	Introduction to wood working machines such as wood working Lathe, Circular saw ,Band saw, Wood planner, Universal wood working machine	03
d	Job involving marking, measuring, planning, sawing, chiseling, joint preparation and assembly of wooden blocks.	06
e	Preparation of job on wood working lathe.	03
4	**Electrical Workshop Practice**	**32**
a	Measurement of Single Phase and Three Phase supply Voltage using multimeter.	02
b	Identification of various hand tools used in electrical trade.	02
c	Measurement of electric circuit parameters using Ammeter, Voltmeter, Frequency meter, Wattmeter.	04
d	Making of Straight and T wire joints.	02
e	Testing of electrical components such as Choke, starter, Fuse, Switch using Series Test lamp and Multimeter	02
f	Starting of induction motor using DOL Starter	02
g	Reversal of direction of rotation of Three phase induction motor	02
h	Identification of commonly used electrical fittings.	02
i	Wiring of simple electrical circuit using bulb and socket.	04
j	Measurement of Energy using Energy Meter.	02
k	Identification of Different types of Fuses and their replacement in circuit.	02
l	Testing of various components and connection of Tube light circuit.	02
m	Collecting Name plate Details of Motors and Transformers and operating and controlling speed of motor from Control panel.	04
5	**Plumbing**	**06**
a	Identification of Plumbing tools and pipe fittings , Reading of plumbing drawings, methods of joining PVC pipes, use of spirit level and plumb bob in piping.	03
b	To carry out minor repairs and replacement of fittings.	03

9. LEARNING RESOURCES

TEXT BOOKS

S. No.	Author	Title of Books	Publishers
1	N. Sesha Prakash	Manual of Fire Safety	CBS Publishers and Distributers
2	S.K. Hajara-Chaudhary	Workshop Technology	Media Promoters
3	B.S. Raghuwanshi	Workshop Technology-	Dhanpat Rai and sons, New Delhi
4	R K Jain-	Production Technology	Khanna Publishers, New Delhi
5	H. S .Bawa	Workshop Technology	Tata McGraw Hill Publishers, New Delhi
6	Kent	Mechanical Engineering Hand book	John Wiley and Sons, New York
7	B.L. Theraja	Fundamentals of Electrical Engineering and Electronics	S. Chand – New Delhi

REFERENCE BOOKS FOR FURTHER STUDY

S. No.	Author	Title of Books	Publishers
1	CIMI- Central Instructional Media Institute Madras	Turner – Trade Theory – Ist and IInd Year	Wiley Eastern Ltd. New Delhi

(GC201) ENGINEERING MATHEMATICS II

1. COURSE OBJECTIVE:

2. The course is aimed at providing mathematical knowledge, developing computational skills and reasoning. It also helps students to think logically and in systematic manner so as to grasp mathematical concepts easily. It helps to build analytical thinking which play an important role in solving real world problems in all scientific discipline.

2. TEACHING AND EXAMINATION SCHEME

Semester	**II**								
Course code & course title		**Periods/Week (in hours)**			**Total hours**	**Examination Scheme**			
						Theory Marks		**TERM WORK**	**Total Marks**
(GC201) Engineering Mathematics II		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**
		4	**2**	**-**	**96**	**75**	**25**	**25**	**-**

3.COURSE OUTCOMES:

GC201.CO1: Understand the basic principles of Matrices ,Integration, Determinants and Vectors in engineering problems.
GC201.CO2: Interpret the formulae to solve problems of Matrices ,Integration, Determinants and Vectors.
GC201.CO3: Apply appropriate mathematical methods for solving engineering problems.
GC201.CO4: Analyse the knowledge of Matrices ,Integration, Determinants and Vectors for various Engineering applications.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	1	1	2	0	2	2
CO2	3	1	1	2	0	2	2
CO3	2	2	2	3	1	2	2
CO4	1	3	2	3	1	2	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**Marks**	**Thr**	**CO**
1 .DETERMINANTS AND MATRICES			**15**	**12**	**CO1, CO2, CO4**
1.1 **Determinants**: Definition & order of determinant, value of determinant, properties of determinants(no question), Cramer's rule for solving equations with two & three variables			7	4	
1.2 **Matrices**: - Definition & order of matrix, types of matrices, Equality of matrices, addition & subtraction, multiplication of matrices, adjoint & inverse of a matrix , solution of linear equations with two & three variables using matrices			8	8	
2 .INTEGRATION			20	22	**CO1, CO2, CO4**
Definition, Standard Formulae, properties of Integration for sum, difference and scalar multiplication, integration of algebraic, trigonometric, inverse trigonometric, exponential, logarithmic, composite function, Integration by substitution, integration by partial fraction, integration by parts					
3 .DEFINITE INTEGRALS			10	08	**CO3**
Definition of definite integral and Properties of definite integral ,integration by parts Applications:Area under the curves & lines and area between the curves and Volumes (simple problems)					
4 .VECTORS			15	12	**CO1, CO2, CO4**
Definition of scalars & vectors, equality of vectors, Addition & subtraction of vectors, triangle, parallelogram laws for addition, position vector, dot product & cross product and their properties and applications, relation between dot and cross product and scalar triple product and applications					
5 .STATISTICS / COMPLEX NUMBERS			15	10	**CO3**
Statistics : **(ME and Allied courses only)** 5.1:Measures of central Tendency -mean, median, mode for ungrouped & grouped data 5.2:Measures of dispersion –Range, mean deviation, standard deviation, variance, coefficient of variation					

5.3: Corrected mean and relation between standard deviation and mean.			**CO3**
5.Complex Numbers (electronics and Allied courses only) 5.1:Definition of complex number and Argand diagram, equality of complex numbers, 5.2:powers of 'i' ,complex conjugates, 5.3:Addition& subtraction of complex nos. Multiplication& division of complex nos. 5.4: Modulus and argument of a complex number 5.5:Polar form & exponential form of complex no. 5.6: De Moivre's theorem., nth root of complex nos. 5.7:Hyperbolic, exponential, circular functions			
Total	**75**	**64**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY (GC201)

Unit No	**Unit**	**Number of lectures**	**Marks**
1	**Determinants & Matrices**	12	15
2	**Integration**	22	20
3	**Definite Integrals**	08	10
4	**Vectors**	12	15
5	**Statistics /Complex Number**	10	15
	Total	**64**	**75**

- Tutorial books should be maintained by students (5 marks)
- Two home assignments per semester (5 marks)

  The Two assignments each comprises of thirty questions which includes 15 short questions and fifteen long questions. First assignment will cover fifty percent of syllabus

  and second assignment will cover remaining portion of syllabus

- Topic-wise class assignment (15 marks)

  Class assignment comprises of ten short and ten long questions.

9. LEARNING RESOURCES

Text Books /reference books

S. No.	Title of Books	Author	Publishers
1	Mathematics for Polytechnic Students(Basic Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
2	Mathematics for Polytechnic Students(Engineering Mathematics)	S.P. Deshpande	Pune VidyarthiGrihaPrakashan 1786, Sadashiv Peth, Pune
3	Applied Mathematics	S.B. Gore, M.B.Patil, S.P. Pawar	Vrinda Publications

Reference Books for further study

S. No.	Title of Books	Author	Publishers
1	Applied Mathematics I	Dr. U.B.Jangam, K.P. Patil, Nalini Kumthekar	Nandu Printers& Publishers Pvt. Ltd. Mumbai
2	Applied Mathematics for Polytechnics	H.K. Dass	CBS Publishers & Distributers Pvt. Ltd. Pune
3	Advanced Engineering mathematics	H.K. Dass	S. Chand

(GC 202) APPLIED PHYSICS- II

1. COURSE OBJECTIVE:

On successful completion of the course, Students completing the Applied Physics II course will be able to demonstrate competency and understanding of the basic concepts found in, Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light and Optics and Sound, and will be able to utilize the knowledge to demonstrate competency with experimental methods that are used to discover and verify the concepts related to content knowledge.

2.TEACHING AND EXAMINATION SCHEME

Semester	**II**								
Course code & course title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GC202) Applied Physics- II		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		03	**0**	**02**	**80**	**75**	**25**	**25**	**-**	**125**

3. COURSE OUTCOMES:

GC202.CO1: Understand the Fundamental Concepts of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound.
GC202.CO2: Explain the basic principles of Electrostatics, Current Electricity, Electromagnetism and Electro Magnetic Induction, Light , Optics and sound.
GC202.CO3: Apply the knowledge of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound to specific applications.
GC202.CO4: Compute various parameters in the field of Electrostatics, Current Electricity, Electromagnetism and Electromagnetic Induction, Light, Optics and Sound.

4. Mapping Course Outcomes with Program Outcomes

Relationship : 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	**Problem Analysis**	**Design and Devlopment of Solutions**	**Engg. Tools, Experimentatn & Testing**	**Engg. Practices for Society,Sustainability& Environment**	**Project Management**	**Life -long Learning**
CO 1	3	3	1	1	2	0	3
CO 2	3	3	1	1	2	0	2
CO 3	3	2	3	3	3	1	1
CO 4	2	2	2	3	1	1	1

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 UNIT NAME: ELECTROSTATICS	**12**	**8**	**CO1, CO2, CO3, CO4**
1.1 Coulomb's law, Electric field,			
1.2 Electric field Intensity, Electric lines of force and properties			
1.3 Electric potential, Definition of Absolute potential			
1.4, Potential difference, Potential of sphere,			
1.5 Potential of earth.			
1.6 Capacitance,			
1.7 Capacitors in Parallel Derivation of Expression			
1.8. Capacitor in series Derivation Of Expression			
2. UNIT NAME: CURRENT ELECTRICITY	**20**	**12**	**CO1, CO2, CO3, CO4**
2.1 Definition of Electric Current and its Unit, Ohm's Law, Resistance,			
2.2 Factors on which resistance depends, Specific resistance. Effect of temperature on resistance Temperature coefficient of resistance,			
2.3 Resistances in Series and parallel			
2.4 EMF and Internal resistance of cell			
2.5 General Equation of ohm's law.			
2.6. Wheatstone's Network and Principle of Meter Bridge			
2.7 Principle of Potentiometer (Vα L) and Applications to compare EMF of given cells by single cell method and sum difference method			
2.8 Determination of Internal resistance of a cell using potentiometer.			
2.9 Electric Power and Electric Energy, KWh			
2.10 Calculation of Energy bills			
2.11 Heating Effect of Electric current. Joule's law.			
2.12 Applications in house hold appliances			
3. **UNIT NAME: ELECTROMAGNETISM AND EM INDUCTION**	**16**	**10**	**CO1, CO2, CO3, CO4**
3.1 Magnet, Magnetic field, Magnetic flux, and magnetic flux density and its unit			
3.2 Magnetic effect of Current, Oersted's Experiment, Right hand Thumb Rule, Biot Savart law			
3.3 Magnetic field at the center of the coil (no derivation), Magnetic field due to coil (Qualitative discussion only			
3.4 Electromagnet. Force acting on a current carrying conductor placed in magnetic field and expression (no derivation)			
3.5 Fleming's left-hand rule. Electromagnetic Induction. Faraday's Experiment			
3.6. Faraday's laws Lenz's law. Self-Induction and Mutual Induction.			
3.7 Transformer Principle.			
3.8 Step up and Step-down transformer.			
3.9 Induction Heating			

3.10 Induction heater and uses			
4. **UNIT NAME: LIGHT AND OPTICS**	**16**	**10**	**CO1, CO2, CO3, CO4**
4.1 Frequency Range of Infrared, ultraviolet and visible light and their uses			
4.2 Reflection, Refraction, Snell's law, refractive index.			
4.3 Refraction through glass slab and prism.			
4.4 Total Internal reflection applications in optical fibers.			
4.5 Advantages of optical fibers. LASER, sources and applications.			
4.6. Luminous Intensity, Intensity of Illumination			
4.7 Inverse square law of Illumination (No derivation)			
4.8 Principle of Photometry, X rays,			
4.9 Production of X Rays by Coolidge tube			
4.10 Properties and applications			
5. **UNIT NAME: SOUND**	**11**	**08**	**CO1, CO2, CO3, CO4**
5.1 Sound as longitudinal wave,wavelength,frequency,time period, amplitude,			
5.2 Free vibration force vibration,resonance, examples,			
5.3 Echo reverberation ,pitch loudeness,intensity of sound,			
5.4 Ultrasonic waves, Piezo electric effect, Principle of Production of ultra-sonics waves			
5.5 Application of Ultra sonics in finding depth of sea,			
5.6. Detection of flaws in metal, soldering, Drilling,			
5.7 Ultrasonic Cleaning			
5.8Ultrasound for medical purposes.(Just Uses)			

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	ELECTROSTATICS	8	12
2	CURRENT ELECTRICITY	12	20
3	ELECTROMAGNETISM AND EM INDUCTION	10	16
4	LIGHT AND OPTICS	10	16
5	SOUND	8	11
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS

No	Practicals	Marks
1.	Specific Resistance by Ammeter Voltmeter Method	25
2	Specific Resistance by Meter Bridge Method	25
3	To Verify the Series Law of Resistance by Meter Bridge Method	25
4	To Verify the Parallel Law of Resistance by Meter Bridge Method	25
5	To Compare the emf of two cells by single cell method	25
6	To find the internal resistance of a cell by Potentiometer Method	25
7	To find the velocity of sound by Resonance Tube method	25

8	To find the Refractive index	25
	Total (Average)	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B G Dhande	Applied Physics of Polytechnics	Pune Vidyarthi Griha Prakashan
2	Bhandarkar	Applied Physics of Polytechnics	Vrinda publication
3	R K Gaur and S L Gupta	Engineering Physics	Dhanpat Rai & Sons Delhi
4	Dr. Vasudev R Bhagwat	A Text Book of Applied Physics for Polytechnics	Broadway Publishing House
5	B L Thereja	Engineering Technology	S. Chand

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Halliday D and Resnick	Physics Part I-II	Wiley Eastern Ltd.
2	Satish k. Gupta	ABC of Physics I&II	Modern Publisher
3	Saxena HC and Singh Prabhakar	Applied Physics Vol I & II	S. Chand Publisher

(GC203) ENVIRONMENTAL STUDIES

1. COURSE OBJECTIVE:

Environment is the nurturing force upon which we depend. It decides our well being, our health & quality of our life. The environment is deteriorating at an alarming rate due to increasing human activity and can be saved only by timely human action. The aim of Environmental studies is to sensitize the students towards the need to conserve & protect natural resources & biological support systems. With the aim to develop an attitude of concern for the environment the students will learn to choose environmentally friendly options for sustainable development and live in harmony with nature.

2. TEACHING AND EXAMINATION SCHEME :

Semester	**I**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
(GC203) Environmental Studies		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		04	**-**	**-**	**64**	**75**	**25**	**-**	**-**	**100**

3. COURSE OUTCOMES:

GC203.CO1: Understand the role and importance of various elements of Environment.

GC203.CO2: Identify the concerns related to the natural resources, ecosystems, biodiversity, pollution and social issues of environment.

GC203.CO3: Develop sensitivity towards Environmental issues.

GC203.CO4: Co-relate causes affecting the environment & biodiversity.

4. Mapping Course Outcomes with Program Outcomes :

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentation	Engg. Practices for Society,Sustainability	Project Management	Life -long Learning
CO1	2	1	1	0	3	2	2
CO2	2	1	1	0	3	2	2
CO3	1	1	1	0	3	2	2
CO4	1	1	2	0	3	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**Mks**	**Thr**	**CO1, CO3, CO4**
UNIT 1.0 : Multidisciplinary Nature of Environmental Studies	**09**	**08**	
1.1 Environmental studies : Definition , Scope and Importance			
1.2 Need for Public Awareness			
1.3 Environment & Human Health			
1.4 Environmental Ethics			
1.5 Value Education			
1.6 From Unsustainable to Sustainable Development : Concept and Guidelines			
1.7 Concept of Environmental Audit (EA) Environment Impact Assessment (EIA)			
1.8 Ecological Foot Prints			
UNIT 2.0 : ECOSYSTEM AND BIODIVERSITY	**15**	**13**	**CO1, CO2, CO3, CO4**
2.1 Ecosystem 2.1.1Concept, Structure & functions of ecosystem (Function of producer, consumer and decomposer) 2.1.2 Food chain & Food web- Concept & Examples 2.1.3 Energy flow in Ecosystem 2.1.4 Ecological Pyramids (Inverted & Upright) Pyramid of Number, Biomass & Energy. 2.1.5 Ecological Succession (Primary & Secondary Succession) 2.1.6 Study of Ecosystem: characteristic features structure and functions) Terrestrial(Forest, Grassland, Desert) Aquatic(Pond, River & Ocean)			
2.2 Biodiversity 2.2.1 Definition of Biodiversity 2.2.2. Types of Diversity (Genetic, Species & Ecosystem) 2.2.3. Value of Biodiversity (Consumptive , Productive, Social ,Aesthetic Moral & Optional value) 2.2.4 India as a Mega- diversity Nation 2.2.5 Biogeographical classification of India 2.2.6 Extinct, Endangered, Threatened & Endemic Species -Examples (of India) 2.2.7 Threats to Biodiversity (Habitat loss, Poaching of Wild life & Man Wildlife Conflict) 2.2.8 Reasons for loss of Biodiversity 2.2.9 Conservation of Biodiversity (Insitu & Exsitu conservation)			
UNIT 3.0 : NATURAL RESOURCES	**18**	**15**	**CO1, CO2, CO3,**
3.1 Forest Resource 3.1.1 Direct & Indirect value of Forest			

3.1.2 Deforestation-causes & effects 3.1.3 Forest Management **3.2** Water Resource 3.2.1 Water as a scarce Resourc 3.2.2Use and over exploitation of surface and ground water 3.2.3 Need for Water Conservation 3.2.4 Construction of dams- Benefits and draw backs (Rehabilitation & Resettlement of people) 3.2.5 Rain water Harvesting. 3.2.6 Watershed Management 3.2.7 Conflicts over water in India **3.3** Energy Resource 3.3.1 Renewable & Non-Renewable sources of Energy 3.3.2 Growing Energy Needs. 3.3.3 Alternate Source of Energy (Solar ,Wind, Bio, Geothermal, Hydro & Nuclear Energy)			**CO4**
3.4 Food Resource 3.4.1 Sources of Food 3.4.2 World Food Problems (Undernourishment & Malnourishment) 3.4.3 Changes caused by agriculture & overgrazing 3.4.5 Effects of modern agriculture on environment (use of synthetic fertilizers & synthetic pesticides in agriculture) **3.5** Mineral Resource 3.5.1 Types of Minerals 3.5.2 Use & Overexploitation of Minerals 3.5.3 Environmental Impact of Mining. **3.6** Land Resource 3.6.1 Pattern of Land Utilization (In India and World) 3.6.2 Land Degradation – Causes & Control Measures			
UNIT 4.0 : ENVIRONMENTAL POLLUTION- Sources , Effects & Control Measures	**24**	**20**	
4.1 Air Pollution 4.1.1 Definition, sources of air pollution(Primary and Secondary air pollutants with examples) 4.1.2 Effects on human health, animals, plants & Materials 4.1.3 Control of Air Pollution. 4.1.4 Removal of Particulate matter 4.1.5 Principles & Application of Control Equipments (Gravity and Inertial Separators, Cyclones, Filters, Electrostatic			**CO1, CO2, CO3, CO4**

precipitators, Wet scrubbers) 4.1.6 Removal of Gaseous Pollutants (Combustion, Adsorption, Absorption) 4.1.7 Global Issues Definition, Cause & effects of Green House effect & Global Warming. Ozone layer Depletion, Acid Rain.			
4.6 Noise Pollution :- 4.6.1 Definition. 4.6.2 Sources of Noise Pollution 4.6.3 Effects of Noise Pollution on Human health (Noise Induced hearing loss, Physiological & Psychological Effects) 4.6.4 Control of Noise Pollution.			
4.7. Nuclear Pollution / Radioactive Pollution:- 4.7.1 Definition 4.7.2. Sources of nuclear Pollution (Natural & Man made) 4.7.3. Effects of Nuclear Pollution 4.7.4. Control of Nuclear Pollution 4.7.5.Disposal of Nuclear waste (Low, Medium & High activity waste) 4.7.6 Nuclear Accidents & Holocaust – case study			
4.8 Solid Waste Pollution. Definition: Refuse, Garbage Sources of Solid waste Types of solid waste (MSW, HW, BMW & EW) Effects of Consumerism Segregation of Solid waste at source Treatment of MSW (Open dumping, Land filling, incineration & composting) Waste Utilization (Reuse, Reclaim & Recycle) Solid waste Management System – Flow sheet diagram **4.9** Role of an Individual in Prevention of Pollution.			
UNIT 5.0 : **SOCIAL ISSUES & ENVIRONMENT**	**09**	**08**	**CO2, CO3, CO4**
5.1 Environmental Legislation Article 47 & Article 51-A(g)of the constitution on Environment. 5.1.1 Protection Functions of Ministry of Environment and Forest Govt. of India Objectives & Functions of Central & state pollution Control Boards Environmental Protection Act. Air (Prevention & Control of Pollution) Act. Water (Preventation & Control of Pollution) Act.			

Wildlife Protection Act. Forest Conservation Act. Motor vehicle Act.			
5.2 Social Issues 5.2.1Women & Child Welfare 5.2.2 Role of IT in Environment & Human Health 5.2.3 AIDS 5.2.4 Population Growth & Variation among Nations 5.2.5 Human Rights			

COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	**MULTI-DISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES**	08	09
2	**ECOSYSTEM AND BIODIVERSITY**	13	15
3	**NATURAL RESOURCES**	15	18
4	**ENVIRONMENTAL POLLUTION**	20	24
5	**SOCIAL ISSUES & ENVIRONMENT**	08	09
	Total	64	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Erach Bharucha	Textbook of Environmental Studies	Universities Press (India) Private Ltd.
2	Dr. Suresh K. Dhameja	Environmental studies	S.K. Kataria & Sons
3	Y. Anjaneyulu	Introduction to Environmental Science	B.S Publications
4	S. Deswal & A. Deswal	A Basic Cource in Environmental Studies	Dhanpat Rai & Co.
5	P. Meenakshi	Elements of Environmental Science and Engineering	Prentice Hall of India (PHI)

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Pandya and Camy	Environmental Engineering	Tata McGraw Hill
2	Asthana D.K. and Asthana Meera	Environmental Problems and Solutions	S. Chand & Co.
3	Gilbert M. Masters	Introduction to Environmental Engineering and Science.	Prentice Hall of India (PHI)
4.	M N Rao & HVN Rao	Air Pollution	Tata McGraw Hill

FIELD ACTIVITIES (OPTIONAL)

1. Visit to Selaulim/ Anjunem Dam.
2. Visit to show Hill cuttings, mining areas.
3. Visit to show Rain water harvesting project / Vermicomposting plant / watershed management project. (Krishi Vigyan Kendra – Old Goa)
4. Visit to Garbage treatment plant.

*__On Completion of visit Report to be submitted.__

(GC204) ENGINEERING DRAWING

1. Course Objective: Drawing is a graphical language of engineering field. Engineering technician irrespective of his/her field of operation in an industry is expected to possess a thorough understanding of drawing, which includes visualization of objects and the proficiency in reading and interpreting a wide variety of engineering drawings. It is the skill, which translates an engineering idea into lines and dimensions. Besides this he/she is also expected to possess a certain degree of drafting skills- depending upon his/her job.

2. **TEACHING AND EXAMINATION SCHEME:**

Course Code & Course Title	**Periods/ Week (In Hours)**			**Total Hours**	**Examination Scheme**				
					Theory Marks		**Practical Marks**		**Total Marks**
(GC204)	**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
Engineering Drawing	-	-	5	80	-	-	50	50	**100**

3. Course Outcomes:

On successful completion of the course the student will be able to:
GC204.CO1: Understand different methods of projection, sectioning of solids and development of surfaces.
GC204.CO2: Select the relevant procedural methods for preparing Engineering Drawing.
GC204.CO3: Draw Isometric views and orthographic projection of full and sectioned objects and development of surfaces
GC204.CO4: Examine and Interpret Engineering Drawings

4. Mapping Course Outcomes with Program Outcomes

Relationship- 1:Slight (low) 2:Moderate(Medium) 3: Substantial(High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	Basic and discipline specific knowledge	Problem analysis	Design & development of solution	Engg tools exptn and & testing	Engg Practice for society,sustainability and environment	Project management	Lifelong learning
CO1	3	2	1	3	1	1	1
CO2	3	1	2	3	1	2	2
CO3	2	2	2	3	1	2	2
CO4	2	2	2	2	1	2	3

5. Detailed course Contents/ Micro lesson plan

M=Marks Prhr= Teaching Hrs CO=Course Outcomes

Unit	Mark	Prhr	CO
1. Introduction 1.1 Importance of engineering drawing as a means of communication. 1.2 Planning of drawing sheet as per SP 46(latest revision) 1.3 Indian standard practices of laying out and folding of drawing 1.4 Different types of lines used in engineering drawing. 1.5 Importance of scale in Engineering Drawings. 1.6 Lettering 1.7 Methods of dimensioning, Dimensioning terms and notation -use of SP 46(latest revision), General rules for dimensioning, Dimensioning of cylinder, holes, arcs of circle, narrow space, angles, countersunk hole, taper.	05	05	CO2
2. Geometrical construction & Engineering Curves 2.1Construction of an Equilateral and Isosceles triangle, Square, Regular pentagon & Regular hexagon given length of a side using general method of construction 2.2Construction of Engineering curves like: Ellipse- by focus & directrix method and arcs of circles method Parabola- by focus & directrix method and rectangle method Hyperbola- Focus and directrix method 2.3 Cycloid- by generating circle rolling on a straight line 2.4 Involutes of a circle. 2.5 Draw normal & tangents to the above curves from given point on the curve Curves to be explained with the help of applications.	05	15	CO2
3. Orthographic projection 3.1 Definitions of various terms associated with orthographic	18	30	CO1, CO2, CO3,

projections. Planes of projections. Concept of Quadrants. 3.2 First and third angle method of projection. 3.3 Projection of points 3.4Projection of lines Parallel to both Principal planes Parallel to one and Perpendicular to other Principal plane. Inclined to one plane and parallel to other plane. 3.5 Projection of planes:Triangle, Square, circle when inclined to one principal plane & perpendicular to other plane. 3.6 Projection of solids: Cylinder, cone. Right regular solids such as (i) Prism: Square& Pentagonal (ii) Pyramid: Triangular & Square. Projections of above mentioned solids when axis is inclined to one principal plane & Parallel to other principal plane. 3.7 Conversion of simple pictorial views into orthographic views. *Problems where one end of the line is in one quadrant & other end in other quadrant and traces are to be excluded.* *Problems where apparent shape of plane are given, true shape & slope angle are to be drawn are excluded.*			CO4
4. Section of solids Development of lateral surfaces **4.1** Concept of sectioning planes, Auxiliary planes and true shape of section. 4.2 Drawing section of solids like square prism, square pyramid, cylinder and cone with sectioning plane inclined to one principal plane and Perpendicular to the other principal plane (Axis of solid perpendicular to one principal plane and parallel to the other) 4.3Concept and importance of surface development in the engineering field. Methods of development of surfaces-Radial & Parallel line method. Development of surfaces for solids like square prism, square pyramid, cylinder and cone.	10	15	CO1, CO3

Development of solids standing on its base & cut by a plane inclined to HP and perpendicular to VP is also included.			
5. Isometric Views 5.1Difference between Isometric projection & Isometric view. 5.2Isometric view of geometrical planes and solids. 5.3Conversion of orthographic views into isometric views. 5.4Construction of Isometric view for any real object.	12	15	CO3, CO4
Total	50	80	

6. Course Delivery:
The course will be delivered through Practicals, class room interaction and exercises.

7. Specification table for Practical/Macro Lesson Plan

Unit No.	**Unit**	**No. Of Practical Hrs.**	**Marks**
1	Introduction	05	05
2	Geometrical construction & Engineering Curves	15	05
3	Orthographic projection	30	18
4	Section of solids Development of lateral surfaces	15	10
5	Isometric Views	15	12
	Total	**80**	**50**

8. Specification table for Practical/ Termwork:

No.	Practical
1	TYPES OF LINES, LETTERING, DIMENSIONING.
2	GEOMETRICAL CONSTRUCTIONS
3	ENGINEERING CURVES
4	PROJECTION OF POINTS & LINES
5	PROJECTION OF PLANES
6	PROJECTIONS OF SOLIDS
7	ORTHOGRAPHIC PROJECTIONS (First angle)
8	ORTHOGRAPHIC PROJECTIONS(Third angle)
9	SECTIONS AND DEVELOPMENT OF SOLIDS
10	ISOMETRIC VIEWS

9. Learning Resources:

Text Books

S.No.	Author	Title	Publisher
1	N.D. Bhatt	Engineering Drawing	Charoter Publisher,Anand
2.	R. K. Dhawan	Engineering Drawing	S. Chand Publishing
3.	K.R. Gopalakrishna	Engineering Drawing	Subhas Publications.

Reference Books only for further study

S.No.	Author	Title	Publisher
1	P.S. Gill	Geometrical Drawing	Kataria & Sons
2	P.S. Gill	Machine Drawing	Kataria & Sons
3	N.D. Bhatt	Machine Drawing	Charoter Publisher,Anand

Indian and International codes needed

S.No.	Author	Title	Publisher
1.	BIS, India	SP 46. (Latest revision).	BIS, India

(GC205) ENGINEERING MATERIALS

1. COURSE OBJECTIVE:

This course is introduced with an objective of providing knowledge to students regarding properties and composition of materials for engineering applications and enabling them to make comparative study of materials while selecting the appropriate material for various engineering applications.

2. TEACHING AND EXAMINATION SCHEME

Semester	II								
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
		L	T	P	H	TH	TM	TW	PR/OR	
(GC205) ENGINEERING MATERIALS		3	--	--	48	75	25	--	--	100

3.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

GC205.CO1: List out the properties of materials used in engineering applications.

GC205.CO2: Explain the composition and properties of various engineering materials.

GC205.CO3: Classify materials based on composition and properties.

GC205.CO4: Select the appropriate material/s for the given engineering application/s.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO1	3	2	0	0	0	0	1
CO2	3	2	1	0	0	0	1
CO3	2	2	2	1	1	0	1
CO4	2	3	3	2	1	0	1

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks | **Thr = Teaching hours** | **CO = Course Objectives**			
Unit	**M**	**Thr**	**CO**
1 INTRODUCTION TO ENGINEERING MATERIALS	**08**	**04**	
1.1 Classification of Materials: Metal and Non-metal, Ferrous Metal & Non-ferrous Metals, Differences between Metals & Non-metals			**CO1, CO2, CO3, CO4**
1.2 Properties of Materials:(Note: Properties to be explained with relevant examples.) 1.2.1 Physical properties – Melting point, Freezing point, Boiling point, Density, Linear co-efficient of expansion, Thermal conductivity, Electrical resistivity			
1.2.2 Mechanical properties – Strength, Elasticity, Plasticity, Ductility, Malleability, Toughness, Brittleness, Hardness, Fatigue, Creep.			
1.2.3 Electrical properties – Resistivity, Conductivity, Temperature coefficient of resistance, Dielectric strength, Thermo-electricity, Super conductivity			
1.2.4 Magnetic properties – Permeability and Coercive force			
1.2.5 Chemical properties - Corrosion resistance and Chemical composition			
2 FERROUS & NON-FERROUS METALS & ITS ALLOYS	**18**	**12**	
2.1 FERROUS ALLOYS: 1.1.1 Low carbon steel, Medium carbon steel, High carbon steel, their carbon percentage, properties & uses. 1.1.2 Cast iron: grey cast iron, white cast iron, their properties & uses 1.1.3 Alloy steels: Constituents of alloy steels such as Phosphorous, Sulphur, Silicon, Manganese and their effect on properties of materials. 1.1.4 Stainless steel, Nickel-chromium-molybdenum steel, its properties & uses. 1.1.5 Tool steel – composition, HSS, properties & uses			**CO1, CO2, CO3, CO4**
2.2 NON-FERROUS METALS & ALLOYS: 2.2.1 Aluminium – Properties & uses 2.2.2 Aluminium alloys – constituents of alloy & their effect on properties of metal 2.2.3 Properties & uses of Duralumin, Y-alloy and Al-Si alloy 2.2.4 Copper – Properties & uses. 2.2.5 Copper alloys – Constituents of alloy & their effect on properties of metal 2.2.6 Properties & uses of Copper – Zinc alloys such as Muntz metal, manganese, bronze, Copper-Tin alloys such as Bronze, Copper-Aluminium alloys such as Aluminium bronzes. 2.2.7 Lead and its hazard to the environment			**CO1, CO2, CO3, CO4**
3 NON-METALLIC MATERIALS	**18**	**10**	
3.1 CONSTRUCTION MATERIALS 3.1.1 Classification of rocks, common building stones and their applications. 3.1.2 Cement: Types of cement, composition and applications 3.1.3 Bricks: Composition, properties, Classification, Special bricks-			**CO1, CO2, CO3, CO4**

Refractory and fly-ash bricks and uses 3.1.4 Clay: Types, products of clay- tiles and pipes 3.1.5 Sand- sources – river, crushed aggregates, applications			
3.2 ENGINEERING CERAMICS 3.2.1 Refractories: Desirable properties, Properties and Applications of Fire clay and Silica Refractory, Difference between acid, basic & neutral refractories 3.2.2 Glass: Properties & uses of soda glass, borosilicate glass and fibre glass 3.2.3 Glass wool: Composition, properties & uses 3.2.4 Timber: Common varieties of timber, uses of wood products, veneer and plywood 3.2.5 Natural & Synthetic abrasive materials: Introduction, Properties & uses			**CO1, CO2, CO3, CO4**
4 CONDUCTOR, SEMI -CONDUCTOR, AND INSULATING MATERIALS	**16**	**12**	**CO1, CO2, CO3, CO4**
4.1 Classification of Materials as Conductor, Semiconductor and Insulating materials			
4.2 Conductor Material: 4.2.1 High conductivity materials: Copper, Aluminium, Carbon, Silver, Lead & Tungsten, their properties as conducting materials and applications. 4.2.2 High resistivity materials: nichrome, constantan, manganin and their applications			
4.3 Insulating Materials: Introduction and Characteristics of Good Insulating materials 4.3.1 Solid Insulating materials- wood, paper, rubber, mica, glass fibre, porcelain, PVC, resins, their characteristics as insulating materials and applications			
4.4 Semiconductor Materials: Silicon & Germanium, their specifications as semiconductor material and uses.			
Unit 5 MAGNETIC & COMPOSITE MATERIALS	**15**	**10**	
5.1 Magnetic Materials: Classification as Diamagnetic, Paramagnetic, Ferromagnetic, List of these materials and their applications			**CO1, CO2, CO3, CO4**
5.2 Composite Materials**:** metal matrix, ceramic matrix and polymer matrix composites, types of reinforcement materials and their applications			
5.3 Paints & Lubricants: 5.3.1 Classification: oil based and polymer based paints 5.3.2 Constituents of Paints – resin, binder, pigment, additives, solvents 5.3.3 Lubricants – Functions of lubricants, Types of Lubricants**,** Composition and Applications			
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures and class room interactions

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit Name	Number of lectures (hrs)	Marks
1	Introduction to Engineering Materials	04	08
2	Ferrous & Non-Ferrous Metals & its alloys	12	18
3	Non-Metallic Materials	10	18
4	Conductor, Semi-Conductor, & Insulating Materials	12	16
5	Magnetic & Composite Materials	10	15
		48	**75**

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R.S. Khurmi	Material Science	S. Chand
2	R. Srinivasan	Engineering Materials & Metallurgy	Tata McGraw Hill
3	TTTI Madras	Electrical Engineering Materials	McGraw Hill Education, 2004
4	S. K. Hajra Choudhury	Material Science and Processes	Indian book distribution
5	P. C. Varghese	Building Materials	PHI
6	J. B. Gupta	Electrical and Electronic Engineering Materials	Katson

SEMESTER-III

Course Code	Name Of Course	Teaching Scheme				Examination Scheme				Total Marks
		L	T	P	H	Theory		Practical		
						TH	TM	PR / OR	TW	
CC 301	Engineering Mechanics	3	1	1	5	75	25	-	25	125
CI 301	Surveying- I	3	-	3	6	75	25	25	25	150
CI 302	Building Construction	3	1	1	5	75	25	0	25	125
CI 303	Concrete Technology	3	-	2	5	75	25	-	25	125
CI 304	Transportation Engineering I	3	-	-	3	75	25	-	-	100
CI 305	Civil Engg. Drawing	1	-	4	5	-	-	50	75	125
	Total	**16**	**2**	**11**	**29**	**375**	**125**	**75**	**225**	**750**
Total Contact Hours - 29 Hours										
L-Lecturers, T- Tutorials, P-Practical, C-Hours, TH-Theory Marks ,TM- Test Marks, PR-Practical Marks, TW-Term Work Marks										
For Training DD - Daily Dairy, PA - Progressive Assessment, TR – Training Marks, SR - Seminar										
Duration of Theory Paper 3 hours										

(CC301) ENGINEERING MECHANICS

1. COURSE OBJECTIVES:

The students will be able to acquire knowledge of Engineering Mechanics is imperative in the analysis of static or dynamic force systems. The related concepts find extensive applications in the analysis of machine elements, fluids, structures, and every engineering problem that involves force or motion. The subject is a basis of myriads of higher-level subjects like Hydraulics, Strength of Materials, Theory of Machines and Machine Design, and practically there is no branch of engineering where the subject renders no scope.

2. TEACHING AND EXAMINATION SCHEME

Semester	III									
Course code & course title		Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
Engineering Mechanics		L	T	P	H	TH	TM	TW	PR/OR	
		3	1	1	5	75	25	25	-	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CC301CO1: Define various force systems, Equilibrium, centre of gravity, friction & dynamics.

CC301CO2: Explain methods to determine unknown reactions, forces, velocities and accelerations, Centroid, centre of gravity, friction machine efficiency, momentum & impulse.

CC301CO3: Solve problems on equilibrium of rigid bodies, centre of gravity, simple machines, friction, kinetics, momentum & impulse.

CC301CO4: Verify various laws & machine equations.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PS01	PSO2
CO1	3	1	0	0	0	0	0	1	0
CO2	3	2	1	1	0	1	0	2	1
CO3	3	3	2	1	0	1	2	3	1
CO4	3	3	1	2	1	2	2	2	2

Relationship : Low-1 Medium-2 High-3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**Thr = Teaching hours**			
Unit		**M**	**Thr**	**CO**
1 Forces and Moments.				
1.1 FUNDAMENTALS Definition and unit of force, types of force, characteristics of force, effects of force, principle of transmissibility of force, resultant, equilibrant.		3	1	
1.2 FORCE SYSTEM System of forces, resolution and composition of forces (Resolution along x and y axis), resolution of force along a plane and perpendicular to it (only introduction, no problems to be framed.)		3	2	**CO1** **CO2** **CO3**
1.3 RESULTANT Application of the principle of resolution to—1) find the resultant of a coplanar, concurrent force system, and 2) determine the missing force when the resultant is given.		6	3	**CO4**
1.4 MOMENT Moment—Definition, unit, sign convention (clockwise moment +, anticlockwise -), couple and its characteristics. Avignon's theorem-- statement and application to compute the resultant in magnitude, direction and position in case of coplanar non-concurrent, and coplanar parallel force system.		6	4	
2 Equilibrium.				
2.1 FUNDAMENTALS Concept of equilibrium of forces, conditions of equilibrium of two forces, three forces, concurrent and non-concurrent force systems, concept and drawing of free body diagram for not more than three bodies.		3	2	
2.2 LAMI'S THEOREM Lami's theorem- statement and application to problems based on strings with suspended weights, and spheres.		6	3	**CO1** **CO2** **CO3** **CO4**
2.3 BEAMS Types of beams, types of support, types of loadings. Application of equilibrium conditions to the beams (Beams with simple or roller support at the two ends) with concentrated loading, UDL, partially applied UDL only.		6	5	
3 Centroid and Centre of gravity.				
Definition of centroid, centroid of rectangle, triangle, circle, semicircle, trapezium. Centroid of simple composite figures (including cut out sections.) Definition of centre of gravity. Centre of gravity of solids-- cone, sphere, cylinder, hemisphere, rectangular solid. Centre of gravity of		9	7	**CO1** **CO2** **CO3**

simple composite solids (including cut out solid portions)			
4 Friction and Simple machines			
4.1Friction—FUNDAMENTALS Concept of friction, Coulomb's law of static friction, coefficient of friction, angle of friction, cone of friction, angle of repose.	3	1	
4.2 APPLICATIONS Application of concept of friction to a block resting on horizontal or inclined plane, ladder friction.	6	5	**CO1 CO2 CO3 CO4**
4.3 FUNDAMENTALS OF SIMPLE MACHINES Definition of simple machine, load, effort, mechanical advantage, velocity ratio, efficiency of machine, law of machine, reversibility of machine, self-locking machine. (Simple problems to be framed, no derivations.)	3	2	
4.4 STUDY OF SIMPLE MACHINES Simple axle and wheel, single purchase crab, double purchase crab, screw jack. (Simple problems to be framed, no derivation.)	6	4	
5 Dynamics			
5.1 KINETICS D' Alembert's principle and its applications to solve simple problems related to motion of lift, two bodies connected by a single string passing over a pulley, two string connected bodies of which one is lying on a horizontal plane (or on inclined plane) while the other suspended freely.	9	5	**CO1 CO2 CO3 CO4**
5.2 MOMENTUM, IMPULSE AND IMPULSIVE FORCE Momentum, impulse and impulsive force—definition and unit. Law of conservation of momentum, simple problems based on momentum, impulse, impulsive force, and law of conservation of momentum.	6	4	
Total	**75**	**48**	

6. COURSE DELIVERY:

The course will be delivered through lectures, class room interactions, exercises and case studies.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Force and moment	10	18
2	Equilibrium	10	15
3	Centroid and centre of gravity	7	9
4	Friction and simple machines	12	18
5	Dynamics	9	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS.

Sr. No.	Practical (Minimum six to be conducted)	Marks
1.	Verification of Polygon law of forces.	
2.	Verification of Lami's theorem.	
3.	Determination of coefficient of friction (between any two different surfaces.)	
4.	Calculation of support reactions using Beam apparatus.	
5.	Determination of MA, VR, efficiency and law of machine for any three simple lifting machines.	
6.	Determination of angle of repose.	
7.	Determination of the resultant of coplanar and concurrent forces (Graphical analysis, one sheet.)	
8.	Determination of the resultant of coplanar, non-concurrent forces, and parallel forces. (Graphical analysis, one sheet.)	
No	**Class room Assignments**	
1	At least three assignments covering above units.	
No	**Tutorial Exercise**	
1	At least six problems on each of the units mentioned above.	
	Total	25

9. LEARNING RESOURCES

9.1 Text Books

S. No.	Author	Title of Books	Publishers
1	Dhade, Jamdar and Walawalkar.	Fundamentals of Applied Mechanics	Sarita Prakashan, Pune.
2	R.S.Khurmi	Applied Mechanics	S. Chand
3	A. R. Basu	Engineering Mechanics	Tata MacGraw Hill, Delhi.
4	Patel, Sanghavi and Thakur	Engineering Mechanics	Mahajan Publishing House, Ahmedabad.

9.2 Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Beer-Johnson	Engineering Mechanics	Tata McGraw Hill, Delhi.
2	Joseph F. Shegley	Vector Mechanics for Engineers Vol-1 and 2	Tata McGraw Hill, Delhi.

9.3Internet and Web Resources

S. No.	Author	Title of Books	Publishers
1	WizIQ	https://www.wiziq.com/tutorials/applied-mechanics	-
2	NPTEL	https://nptel.ac.in/courses/122102004	-

9.4 Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	CDs of experiments in Engineering Mechanics.	-
2	NPTEL	CDs of experiments in Engineering Mechanics.	-

(CI 301) SURVEYING I

1. COURSE OBJECTIVES:-

Surveying is one of the core subjects in civil engineering wherein principles and method of different types of surveys are studied. The course content is designed to: a) enable the students to study and carry out surveying & levelling operations independently on the field b) able to apply knowledge to the solution of day to day problems on construction site; and c) develop the skills in handling various survey instruments.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**III**									
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**				
						Theory Marks		**Practical Marks**		**Total Marks**
CI 301 Surveying I		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/~~OR~~**	
		3	**0**	**3**	**6**	**75**	**25**	**25**	**25**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO 301.1. Understand and practice basic land measurement using appropriate equipments

CO301.2. Identify and apply surveying principles to prepare maps and sections

CO301.3. Sketch and calculate map areas and volumes

CO301.4. Manage and plan basic land surveying

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO301.1	3	1	1	2	1	1	2
CO301.2	3	1	1	2	1	1	2
CO301.3	2	3	3	3	2	2	3
CO301.4	2	3	3	3	2	2	3
Total	**10**	**8**	**8**	**10**	**6**	**6**	**10**

Relationship: Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO301.1	2	2
CO301.2	2	2
CO301.3	3	3
CO301.4	2	3
Total	**09**	**10**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**

	M	**Thr**	**CO**
UNIT 1: TYPES OF SURVEY			
1.1 INTRODUCTION Definition. Objects of surveying, Principles of surveying. Uses of Survey, Conventional signs related to survey:	3	4	1
1.2 CLASSIFICATION OF SURVEYING classification of surveying, types of primary surveying (plain, geodetic) secondary surveying (Based on instruments), method, object, nature of field	6	4	1
UNIT 2: BASIC SURVEYING			
2.1 BASIC INSTRUMENTS FOR LINEAR MEASUREMENT Study and use of instruments for linear measurements – chain, tape, ranging rod, arrows, pegs, cross staff, optical square, and line ranger.	6	3	1
2.2 MEASURING TECHNIQUES Direct and indirect ranging, linear measurements on plain and sloping grounds, Triangulation -– Survey Station and their Selections, Survey lines, Check lines, Tie lines, base line. Taking offsets, perpendicular offset and inclined offset. Finding area of field using tape & cross staff	6	4	2
2.3 OBSTACLES AND ERRORS Obstacles and errors in linear measurements (no numerical problems)			2

2.4 COMPASS SURVEY Components, Construction, and use of Prismatic compass Bearing of lines – meridian –true, magnetic, and arbitrary. Bearing (fore-bearing, back bearing, whole circle bearing, quadrantal bearing system and reduced bearing), conversion of bearings, finding included angles from bearings, local attraction-causes, precaution &correction(simple numerical problem)	6	4	3
2.5 TRAVERSING (Definition or brief description only) Open traverse, closed traverse, check on open and closed traverse. graphical adjustment for closing error by Bowditch rule	6	3	3, 4
UNIT 3: LEVELLING			
3.1 INTRODUCTION (Definition only) Level surface, level line, horizontal line, vertical line, datum surface, reduced level, benchmark & its types- temporary, permanent, GTS benchmark. Fore sight, back sight, Intermediate sight, change point and height of collimation.	6	4	1
3.2 INSTRUMENTS (sketch and brief description only) Dumpy level, Tilting Level, Auto Level & Levelling staff (Telescopic type only); fundamental axes of dumpy level	6	2	1
3.3 CLASSIFICATION OF LEVELLING (sketch and brief description only) Simple, differential, profile levelling and cross-sectioning, fly levelling		2	2
3.4 RECORDING IN LEVELLING BOOK Height of Instrument method, rise and fall method, arithmetic checks, problems in H.I. method only. Sources of errors, precautions to eliminate the errors	6	4	2
UNIT 4: CONTOURING			
4.1 INTRODUCTION (Definition only) contour, contour interval, horizontal equivalent	3	2	2
4.2 CONTOURING Characteristics of contours, method of contouring – Direct and Indirect methods. Interpolation of contours (arithmetic interpolation method only). Uses of contour maps.	9	6	3, 4
UNIT 5: PLANE TABLE SURVEY			
5.1 INTRODUCTION Principles of plane table survey. Accessories required, Telescopic Alidade, Setting out of plane table, levelling, Centering and orientation. Merits and Demerits of plane table Surveying. Situations where plane table survey is used.	6	4	1, 2
5.2 METHODS OF PLANE TABLE SURVEYING Surveying by methods of Radiation and Intersection.	6	4	3, 4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Types of Survey	8	9
2	Basic Surveying	14	24
3	Levelling	10	18
4	Contouring	8	12
5	Plane Table Survey	8	12
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical (Any 10)	Marks
1	Study of different instruments for linear measurement	2
2	Measurement of area by tape and cross staff survey.	2
3	Study of compass Measuring fore bearing and back bearing for traverse (5 to 6 sided). (drawing sheet)	2
4	Study of dumpy level	2
5	Simple and Reciprocal Levelling, Profile levelling and cross-sectioning, Fly levelling.(drawing sheet)	4
6	Contouring by direct method(drawing sheet)	2
7	Contouring by indirect method	2
8	Plane table survey Radiation,	2
9	Plane table survey intersection	2
No	**Class Room Assignments**	**Marks**
1	At least 5 covering all units above	5
No	**Tutorial Exercise**	**Marks**
...	Total	25

9. LEARNING RESOURCES:

Text Books

S. No.	Author	Title of Books	Publishers
1	N.N.Basak	Surveying And Levelling	Tata Mc Graw-Hill
2	Dr. B. C. Punmia	Surveying And Levelling Part I And II	Laxmi Publication
3	N. Subramanian	Surveying And Levelling	Oxford Publication
4	S. K. Duggal	Surveying And Levelling Vol. I And II	Tata Mc Graw-Hill
5	S.K.Husain, M.S.Nagaraj	Text Book Of Surveying	S. Chand And Company

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 302) BUILDING CONSTRUCTION

1. COURSE OBJECTIVE:

The building construction is one of the core subjects of study after studying which they would be able to identify the components of buildings and their functions. They will also be able to understand the procedure for execution of various construction activities. They will be able to prepare the checklist for construction activities, identify and suggest the rectification to various construction related problems.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**III**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CI 302 Building Construction		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**0**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO302.1. Comprehend and Identify basic components and processes used in the construction of the building

CO302.2. Differentiate and Inspect, basic properties of material being used in the construction of the building

CO302.3. Interpret and Assess construction problems

CO302.4. Formulate and Plan appropriate remedies to problems

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO302.1	3	1	1	1	1	2	2
CO302.2	3	2	1	2	1	2	2
CO302.3	2	3	3	3	2	3	2
CO302.4	3	3	3	3	2	3	2
Total	**11**	**9**	**8**	**9**	**6**	**10**	**8**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO 302.1	2	3
CO302. 2	3	3
CO302. 3	3	3
CO 302.4	3	3
Total	**11**	**12**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**

	M	**Thr**	**CO**
UNIT 1: BUILDING COMPONENTS			
1.1 BUILDING COMPONENTS Substructure (foundation, plinth, basement) .Superstructure (walls, floors, openings, roof, beams, columns).	6	2	1
1.2 TYPES OF STRUCTURES load bearing structures, framed Structures, composite structures		2	1
1.3 DOORS Types (panelled doors, battened doors, flush doors, collapsible doors, rolling shutters, Revolving doors, Glazed doors) doors fittings, lintels.	6	2	1
1.4 WINDOWS Types (fully panelled, partly panelled and glazed, glazed wooden, steel, Aluminium windows, sliding windows, louvered window, ventilators, cement grills) window fittings, Sill, and weather shed		2	1
1.5 COMMUNICATION SPACES Horizontal (Passage, balcony, veranda, gallery, sit-outs) and vertical (staircases and lifts)	6	2	1
UNIT 2: BUILDING MATERIALS			
2.1 TIMBER characteristics of good timber, defects in timber, types of timber products(Plywood, particle board ,veneer, laminated paper veneer (sunmica / formica), artificial Timber)	6	2	2
2.2 CONCRETE AND MORTARS Types and functions of mortars and concretes (adobe Lime, cement and composite)		2	2
2.3 STONE Types of stones, dressing of stones, quarrying of stones ,Terms (facing,	6	3	2

backing, hearting, through stone, Corner stone) precautions and construction procedure of Un-coursed rubble masonry and coursed rubble masonry, mortars for stone masonry, sizes of Lateritic stone.			
2.4 BRICK Conventional bricks, standard bricks, Common terms used in brick masonry, requirements of good brickwork,, Bonds in brick masonry (English, Flemish, Stretcher and Header Bonds). Precautions and process in Brick laying, striking and raking of Joints.		3	2
2.5 MISCELLANEOUS Uses of (Glass, plastic, fibres, aluminium, steel , galvanized iron, asphalt bitumen, PVC, CPVC, EPS, coir, terracotta, ceramic)	6	2	2
UNIT 3: BUILDING FINISHES			
3.1 FLOOR FINISHES Types (shahabad, kota, marble, granite, kadappa, ceramic tiles, vitrified, mosaic tiles, chequered tiles, glazed tiles, pavement blocks, Concrete floors, tremix floor) skirting and dado, process of laying and polishing of floors.	9	2	1, 2
3.2 ROOFS AND ROOF COVERING Types (AC sheets ,G.I. sheets, plastic sheets, fibre Sheets, Mangalore tiles) Wooden (King post and queen post) and steel (fan and pratt) truss and maximum span for each. R.C.C. slab, Wooden Floors		2	1, 2
3.3 PLASTERING Necessity of plastering, single coat and double coat plaster, Neeru and POP finishing, special plasters stucco plaster, Precaution to be taken while plastering. Defects in plaster. Necessity and procedure of pointing.	6	2	1, 2
3.4 WALL CLADDINGS Necessity and types, Plaster board		1	1, 2
3.5 PAINTS AND VARNISHES Necessity, surface preparation, method of application, types.		2	1, 2
UNIT 4: SPECIAL CONSTRUCTION PROCESSES			
4.1 FIRE PROOFING Necessity, Materials, Method	6	2	3, 4
4.2 TERMITE PROOFING Necessity, Materials, Method		2	3, 4
4.3 SOUND PROOFING Necessity, Materials, Method	6	2	3, 4
4.4 DAMP PROOFING Necessity, Materials, Method		2	3, 4
4.5 LIGHTING AND VENTILATION Natural and artificial lighting and ventilation, Air-conditioning		2	3, 4
UNIT 5: CONSTRUCTION WORKS			

5.1 JOB LAYOUT Site clearance, Site layout, marking layout on ground	6	2	3, 4
5.2 EXCAVATION AND BACK FILLING Excavation for foundation, timbering and strutting, material for plinth filling.		2	3, 4
5.3 SUPPORTING STRUCTURES Scaffolding (Purpose, types, erection and dismantling). Shoring (Purpose, types, safety precautions) Underpinning (Purpose, types, safety precautions)	6	3	3, 4
Total	**75**	**48**	

1. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

2. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Building Components	10	18
2	Building Materials	12	18
3	Building Finishes	9	15
4	Special Construction Processes	10	12
5	Construction Works	7	12
	Total	**48**	**75**

3. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical	Marks
1	Setting out of building	1
2	Different bonds in bricks	1
3	Laying tiles on sand bed	1
4	Assembly / Tying of scaffolding	1
5	Make formwork for column/footing etc.	1
No	**Class Room Assignments (at least 10)**	**Marks**
1	Types of concretes	1

2	Types of mortars	1
3	Dressing and quarrying of stones	1
4	Types of flooring	1
5	Types of tiles	1
6	Types of roofing	1
7	Types of Paints	1
8	Fire Proofing	1
9	Termite Proofing	1
10	Sound Proofing	1
11	Damp Proofing	1
12	lighting and ventilation	1
13	Air-conditioning	1
No	**Tutorial Exercise (at least 10)**	**Marks**
1	Types of	1
2	Cross –section of wall through (parapet-roof-wall-window- plinth-foundation)	1
3	Types of Doors	1
4	Types of Windows	1
5	Types of door and window fittings	1
6	Types of staircases	1
7	Sit-out and gazebo	1
8	Types of defects in timber	1
9	Un-coursed rubble masonry, coursed rubble masonry, Ashler Masonry	1
10	Types of bonds in bricks(English, Flemish, Stretcher and Header)	1
11	Wooden (King post and queen post)and steel (fan and pratt) truss	1
12	Cross section of wooden floor	1
13	Types of pointing	1
14	Site layout	1
15	Types of timbering and strutting in excavation	1
16	Types of Scaffolding	1

17	Types of Shoring	1
18	Types of Shoring	1
	Total	**25**

4. LEARNING RESOURCES:

Text Books

S. No.	Author	Title of Books	Publishers
1		Lecture and Practical Notes on Building Construction for polytechnic students	
2	D.N. Ghose	Construction Materials	Tata McGraw-Hill
3	S.K. Sharma	Building Construction	Tata McGraw-Hill
4	Amarjit Agrawal	Building materials	New India Publication
5	S. K. Duggal	Building materials	New Age International
6	S.K. Sharma	Engineering materials	PHI Publication
7	S. C. Rangawala	Building Construction	Charotar Publication
8	Sushil Kumar	Building Construction	Standard Publication
9	B. C. Punmia	Building Construction	Laxmi Publication

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	W. B. Mackay	Building Construction Vol. I to IV	Longman(ELBS)
2	Dr.Janardan Zha	Building Construction	Khanna Publication
3	TTTI ,Madras	Civil Engineering materials	TTTI ,Madras
4	S. P. Arora and Bindra	Building Construction	Dhanpat Rai Publication
5	Mantri Construction	A to Z of Building Construction	Mantri Publication
6	Khanna	Practical Civil Engineering Handbook	Khanna Publication

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1	BIS SP 7	National Building Code	
2	BIS 962-1973	Code of Architectural and Building Drawing	
3	BIS 1256-1967	Code for Building Byelaws	
4	BIS 1038- 1983	Steel Doors, Windows and Ventilators	

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 303) CONCRETE TECHNOLOGY

1. Course Objective:

Concrete is the most unique construction material which can be moulded to any size and shape. The quality of concrete governs the performance of the resulting structure and therefore, knowledge of theory and practice of good concrete making is vital in civil engineering. This course gives students a knowledge of concrete composition, making of good concrete, tests on concrete, mix design and non-destructive testing.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**III**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CI 303 Concrete Technology		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO303.1. Recognize and identify types of constituent materials and admixtures for concrete

CO303.2. Experiment, test and inspect properties of concrete and its ingredients

CO303.3. Interpret test results and employ engineering knowledge to practice economic mix proportions

CO303.4. Organize and manage concreting operations effectively

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO303.1	3	1	1	1	1	2	2
CO303.2	2	2	2	3	2	2	2
CO303.3	3	2	2	3	1	3	3
CO303.4	3	2	2	3	3	3	3
Total	**11**	**7**	**7**	**10**	**07**	**10**	**10**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2

	Construction Planning and Practice	Construction Management and Design
CO303.1	2	2
CO303.2	3	1
CO303.3	3	2
CO303.4	3	3
Total	**11**	**8**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**

	M	**Thr**	**CO**
UNIT 1: INGREDIENTS OF CONCRETE			
1.1 CEMENTATIOUS MATERIALS Cementatious materials used in construction Lime, Pozzolana, Fly-Ash, GGBS OPC, Blended cements. Different grades of OPC (33, 43 , 53 & their physical properties as per relevant I. S. Codes) Field test on cement; reduction in strength, storage of cement	6	3	1
1.2 PHYSICAL PROPERTIES OF CEMENT specific gravity, fineness, chemical composition; Hydration process ; compounds of cement Determination of fineness, standard consistency, initial and final setting times, soundness ,compressive strength,	6	3	2
1.3 FINE AGGREGATES Types –natural, manufactured; size ,shape, surface texture ,specific gravity, bulk density Surface moisture, water absorption, bulk density. Bulking - it's effect on concrete mix proportion. Determination of fineness modulus, grading zones. Silt content limit	6	3	2
1.4 COARSE AGGREGATES Types- natural, manufactured; size, shape, surface texture, water absorption, soundness, specific gravity & bulk density Determination of fineness modulus, grading, crushing value, impact value, abrasion value, flakiness index, elongation index		3	2
1.5 WATER AND ADMIXTURES Requirements of water suitable for concrete making. Water-cement ratio, it's importance. Types of admixtures (accelerators, retarders, air-entraining agents, pore fillers, plasticizers, super – plasticizers, colouring agents.)and their uses	6	3	2
UNIT 2: CONCRETING OPERATIONS			
2.1 GRADES OF CONCRETE AND BATCHING Different grades of concrete as per provisions of IS 456-2000. Proportioning of ingredients of concrete by volume batching and weigh	6	3	2,3

batching. Yield of concrete per batch.			
2.2 MIXING TRANSPORTATION &PLACING OF CONRETE Hand mixing, machine mixing, classification of concrete mixers. Various methods and precautions to be taken while transporting and placing concrete. Segregation and bleeding	6	4	2, 3, 4
2.3 COMPACTION AND CURING OF CONCRETE Hand compaction, use of vibrators, advantages ,precaution to be taken while compacting. Purpose of curing, different methods of curing, minimum curing period.	6	4	4
UNIT 3: PROPERTIES AND TESTS ON CONCRETE			
3.1 PROPERTIES Workability – definition, factors affecting, methods of improving workability. Tests for measurement of workability; slump test, compacting, factor test, flow test.	6	3	2, 3
3.2 TESTS ON HARDENED CONRETE Compressive strength of concrete, factors affecting. Determination of compressive strength as per IS :516		2	2, 3
3.3 NON- DESTRUCTIVE TESTING OF CONCRETE Importance of NDT, methods of NDT rebound hammer test &ultrasonic pulse velocity test, As per I.S. 13311 part 1 & 2 .Concrete cover tests on reinforced concrete members.	6	3	2, 3
UNIT 4: SPECIAL CONCRETES & CONCRETING TECHNQUES			
4.1 SPECIAL CONCRETES Properties ,advantages and limitations of following types of concretes a) Ready mix concrete b) Pre-cast concrete c) Pre-stressed concrete d) light weight concrete e) Self-compacting concrete f) Ferro-cement concrete g) Pervious concrete h) High performance concrete i) High strength concrete	6	5	1
4.2 SPECIAL CONCRETING TECHNQUES Description with sketch of following types of techniques(Detailed procedure not expected) a) Under water by Pre-packed concrete, b)Under water by bucket placing, c) Under water by Tremie method. b) Cold weather concrete c) Hot weather concrete	6	5	1, 4
UNIT 5: CONCRETE MIX DESIGN			
5.1 INTRODUCTION Objectives of mix design, list of different design methods.	3	1	3, 4
5.2 MIX DESIGN IS Code Method of concrete mix design for the data given –grading zone of sand, Maximum size of aggregate, exposure condition, slump value or compacting factor, degree of quality control.	6	3	3, 4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Ingredients of concrete	15	24
2	Concreting operations	11	18
3	Properties and tests on concrete	8	12
4	Special concretes and Concreting techniques	10	12
5	Concrete mix design	4	9
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical (Any 10)	Marks
1	Determination of fineness of cement by Blaine's air permeability apparatus or by sieving.	2
2	Determination of standard consistency of cement	2
3	Determination of initial & final setting times of cement	2
4	Determination of specific gravity cement	2
5	Determination of compressive strength of cement.	2
6	Determination of soundness of cement.	2
7	Determination of silt content in sand by volume / weight	2
8	Determination of maximum % of bulking of sand	2
9	Determination of aggregate impact value	2
10	Determination of aggregate abrasion value	2
11	Determination of aggregate crushing value	2
12	Determination of bulk density & water absorption, fine aggregate	2
13	Determination of bulk density & water absorption, coarse aggregate	2
14	Compressive strength of concrete Cube for different Water cement ratio	2

15	Workability of concrete by slump test	2
16	Workability of concrete by compacting factor test	2
No	**Class Room Assignments**	**Marks**
1	At least 10 covering all units above	5
No	**Tutorial Exercise**	**Marks**
...	Total	25
ORAL EXAMINATION BASED ON PRACTICAL PERFORMED DURING TERM		

9. LEARNING RESOURCES:

Text Books

S. No.	Author	Title of Books	Publishers
1	B L Handoo ,L D Puri Sanjay Mahajan	Concrete technology	Satya Prakashan New Delhi
2	M. L. Gambhir	Concrete Technology	Tata Mc Graw . Hill Publishing Co. Ltd. New Delhi
3	M. S. Shetty	Concrete technology	S. Chand Publication
4	Gupta V P	Concrete technology and good construction practice	New age International (p) Ltd New Delhi

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	A. M. Neville & J J Brooks	Concrete Technology	Pearson Education (Singapore) Pvt. Ltd. New Delhi
2	Noel P. Mailvaganam, M.R. Rixom	Chemical Admixtures for Concrete	CRC Books

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1	I.S.4031 (Part 1 to Part 6)	Indian standard method of physical tests for hydraulic cement, BIS, New Delhi. I.S.4031 (Part 1) - 1996 Part 1 – Determination of fineness by dry sieving. I.S.4031 (Part 2) -1999 Part 2 – Determination of fineness by air permeability method. I.S.4031(Part 3) -1988 (reaffirmed 2000) Part 3– Determination of soundness I.S.4031(Part 4) - 1988 (reaffirmed 1995) Part 4 - Determination of consistency of standard cement paste. I.S.4031 (Part 5) – 1988, (reaffirmed 2000) Part 5 - Determination of initial and final setting times I.S : 4031 (Part 6) – 1988, (reaffirmed 2000) Part 6 - Determination of compressive strength of hydraulic cement other than masonry cement	
2	I.S : 2386 – 1963 (part i to part vi)	Indian standard methods of test for aggregate for concrete. BIS, New Delhi. Part i - Particle size and shape. (reaffirmed 1997) Part ii - Estimation of deleterious materials and organic impurities. (reaffirmed 2002) Part iii - Specific gravity, density, voids, absorption & bulking. (reaffirmed 1997) Part iv - Mechanical properties (reaffirmed 1997) Part v - Soundness. (reaffirmed 1997) Part vi - Measuring mortar making properties of fine aggregate. (reaffirmed 2002)	
	I.S.: 383 – 1970	Indian standard specification for coarse & fine aggregates from natural sources for concrete. B.I.S.., New Delhi	
3	I.S. : 1911 - 1959 (reaffirmed)	Indian Standard methods of sampling and analysis of concrete), B.I.S.., New Delhi.	
4	I.S. : 456 - 2000	Indian standard, plain and reinforced concrete – code of practice. (fourth revision), B.I.S.., New Delhi	
5	I.S. : 516 – 1959	Indian standard methods of tests for strength of concrete (xii reprint December 1987), B.I.S.., New Delhi	
6	I.S. : 8112- 1989	Indian standard - 43 grade ordinary portland cement Specification	

7	I.S. : 12269 – 1987 (reaffirmed 1999)	Indian standard specification for 53 grade O.P.C	
8	I.S. : 9103 – 1999	Indian standard –concrete admixtures specification	
9	I.S. : 455 - 1989 (reaffirmed 1995)	Indian standard – Portland slag cement specification	
10	I.S. : 1489 – 1991 (Part 1)	Portland – Pozzolana Cement – specification part 1 fly ash based	
11	I.S. : 7861 - 1975 (Part 1) (reaffirmed 1997)	Indian standard of practice for extreme weather concreting part 1 recommended practice for hot weather concreting	
12	I.S.: 7861 – 1981 (Part 2) (reaffirmed 1997)	Indian standard of practice For extreme weather concreting part 2 – recommended practice for cold weather concreting	
13	I.S. : 8041 – 1990	Indian standard – rapid hardening Portland Cement specification BIS- New Delhi	
14	I.S. : 12330 – 1988 (reaffirmed 1995)	Indian standard specification for sulphate resisting Portland cement	
15	I.S. : 12600 - 1989 (reaffirmed 1995)	Portland cement, low heat Specification	
16	I.S. : 10262 – 1982	Indian standard recommended guidelines for concrete Mix Design	
17	SP 23	handbook on concrete mixes (based on Indian standards)	
18	I.S. 13311- 1992 (Part 1 & 2)	Methods of non-destructive testing of concrete. part-1 ultrasonic pulse velocity, part-2 rebound hammer	

(CI 304) TRANSPORTATION ENGINEERING-I

1. COURSE OBJECTIVES:

This subject is designed to provide knowledge of construction and maintenance of highways, traffic engineering, tunnels, marine structures, airports and bridges needed for the economic development of this country. The course will enable the students to: a) understand different transport systems, its classifications and specifications b) execute construction work as per the approved drawings and specifications and

c) undertake maintenance works.

2. TEACHING AND EXAMINATION SCHEME:

Semester									
Course Code & Course Title	Periods / Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
	L	T	P	H	TH	TM	TW	PR/OR	
CI 304 Transportation Engineering-I	3	0	0	3	75	25	0	0	100

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO304.1. Understand and recognize modes of transportation

CO304.2. Apply engineering knowledge to interpret road traffic characteristics

CO304.3. Distinguish and differentiate component parts and develop different transportation works

CO304.4. Manage, plan and construct types of transportation infrastructure.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO304.1	2	-	1	1	2	2	2
CO304.2	2	2	2	2	2	2	2
CO304.3	3	2	3	1	2	1	3

CO304.4	3	2	2	2	2	3	3
Total	**10**	**6**	**8**	**6**	**8**	**8**	**10**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO304.1	1	1
CO304.2	3	2
CO304.3	3	2
CO304.4	3	3
Total	**10**	**8**

6.DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: TRANSPORTATION					
1.1 INTRODUCTION Role of transportation in the development of nation. Modes of transportation system and Importance of each (roadway, railway, airway, waterway) Advantages and disadvantages of each			6	2	1
1.2 MODERN MEANS OF TRANSPORTATION Brief description of modern means of transportation- hovercraft, jetpacks, bullet trains, mag-lev trains.				2	1
UNIT 2: ROADWAYS					
2.1 INTRODUCTION Classification of roads according to (importance, materials of construction, load carrying capacity and traffic density).			6	1	1
2.2 COMPONENTS OF ROADS Definition with sketch - carriageway, formation width, land width, shoulder, berms, spoil-banks, borrow pits, lead and lift, building line, control line, sub-grade, camber, gradients, super elevation ,curves, sight distance, overtaking distance, passing places. (as per IRC)				3	4

2.3 TYPES OF ROADS Cross sections and Construction procedure for (Hill roads, WBM Roads and Earth Roads, Cement Concrete Roads, Bituminous Roads) Maintenance and special repairs of hill roads. Defects in W.B.M. roads and their maintenance. Type &necessity of joints of concrete roads, Prime coat, tack coat and seal coat. semi-grout and full grout macadam, bituminous/tar carpet, bituminous concrete. Defects and maintenance of bituminous roads.	9	8	3
2.4 DRAINAGE AND ARBORICULTURE Surface and sub-surface drainage with side gutters, catch drains, longitudinal drains, cross drain. Definition of Arboriculture, purpose of planting road side trees.	6	4	4
UNIT 3: OTHER MODES OF TRANSPORTATION			
3.1 RAILWAYS Rail gauges (Broad gauge, meter gauge, narrow gauge) and their widths. Cross-section of B-G Railway track in full embankment and cutting for a single line. Rails and sleepers (Functions, types and standard section). Ballast (Function, requirements, materials used).	6	4	1, 3, 4
3.2 MARINE STRUCTURES Definition and, function (Harbour, docks, ports, Locks, Break-water-Jetties and quays). function and location (Aprons, Warehouses and transit sheds)	6	4	1, 3, 4
3.3 AIRPORTS Classification, location, size and site selection for airports. Definition and functions of (Runway, Taxiways, terminal areas, apron, control tower and hangers). Sketch of Airport lighting.	6	4	1, 3, 4
UNIT 4: TRANSPORTATION INFRASTRUCTURE			
4.1 TUNNEL Definition, purpose, advantages and disadvantages, Typical cross-sections for tunnels, types of lining, Ventilation.	6	4	4
4.2 BRIDGE Sketch showing the different components, functions of each component in a bridge. Sketch of types of bridges (RCC and steel, pre-stressed concrete, balanced cantilever, suspension and steel trussed bridges, Flyover, Clover leaf,) Definition of (Afflux, Scour, Freeboard, Cut water, Case water). Functions of Bearings.	6	4	4
4.3 CULVERTS AND CAUSEWAYS types of Culverts and Causeways, Ribandar causeway (case study in brief), Difference between bridge and culvert	6	2	4
UNIT 5: TRAFFIC ENGINEERING			
5.1 INTRODUCTION Definition and Scope; Road user characteristic and vehicular characteristic	6	2	2
5.2 TRAFFIC STUDY	6	4	2

Traffic studies (Traffic volume study, speed study, O & D study, Traffic flow characteristics, Traffic capacity study, Parking study, Accident studies) sketches of Traffic Signs (Regulatory Signs, Warning Signs, Informatory Signs).			
Total	**75**	**48**	

7.COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

8.SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of Lectures	Marks
1	Transportation	4	6
2	Roadways	16	21
3	Other modes of transportation	12	18
4	Transportation infrastructure	10	18
5	Traffic Engineering	6	12
	Total	**48**	**75**

5. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical	Marks
No	**Class Room Assignments**	**Marks**
1	At least 05 covering all units above	
No	**Tutorial Exercise**	**Marks**
.	Total	

5.LEARNING RESOURCES:

Text Books

S. No.	Author	Title of Books	Publishers
1		Lecture and Practical Notes on Basic Transportation Engineering for polytechnic students	
2	N L Arora	A text Book of Transportation Engineering	IPH Publications, New Delhi
3	Khanna & Justo	Highway Engineering	Nemchand & Brothers, Roorkee
4	S.P Bridra	Tunnel Engg	Dhanpat Rai s. Sons 1682, Naisarak, New Delhi- 110006
5	S.P Bridra	Dock & Harbour Engg	Dhanpat Rai s. Sons 1682, Naisarak, New Delhi- 110006
6	Saxena &Arora	A Textbook of Railway Engg	Dhanpat Rai s. Sons 1682, Naisarak, New Delhi- 110006
7	Birdi & Ahuja	Roads, Railways, & Bridges	standard book house, New-Delhi
8	T D Ahuja	Roads, Railways, Bridges & Tunnel Engineering	Standard Publishers & Distributors, New Delhi
9	N. Vaziram & S.P Chandola	Transportation Engg. Vol I & II	Khisnna Publishers, 2-B, Nath market, Nai sarak Delhi
10	B.L. Gupta & Amit Gupta	Roads, Railways, Bridges Tunnel Engg	standared publications, 1705- B, Naisarak Delhi- 6
11	Kamala	Transportation Engineering	Tata McGraw Hill Publishing Company Limited, New Delhi
12	S.C. Saxena	Railway Engineering	Dhanpatrai & sons
13	K.R. Antia	Railway Track	The New Book Co. Pvt. Ltd Mumbai
14	S.C. Rangwala	Principles of Railway engineering	Charotar Publication
15	S.P. Bindra	Principles and Practice of Bridge Engineering	Dhanpatrai & sons
16	N.L.Arora and S.P. Luthra	A Text Book of Transportation Engineering	IPH New Delhi

17	J.S. Alagia	Elements of Bridge Engineering	Charotar Publication
18	D.R. Phatak	Bridge Engineering	Everest Publisher

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	D. Johnson Victor.	Elements of Bridges	Oxford & IBH Publishing Co
2	S.C. Saxena	Tunnel Engineering	Dhanpatrai & sons
3	Birdi & Ahuja	Road, Railway and Bridges	Std. Book House
4	Robert Horonjeff, Francis McKelvey, William Sproule and Seth Young	Planning and Design of Airports5th Edition	McGraw-Hill 2010
5	Norman J. Ashford, Saleh Mumayiz, Paul H. Wright	Airport Engineering: Planning, Design, and Development	2011

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 305) CIVIL ENGINEERING DRAWING

1. COURSE OBJECTIVES:

The course content is designed to enable the students to understand and apply the principles of planning of residential and public buildings to prepare working drawings for the same. Students shall acquire knowledge of various agencies employed in building industries and their roles and functions. The students shall also be able to understand and apply the principles subdivision of plots.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**III**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CI 305 Civil Engineering Drawing		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		1	**0**	**4**	**5**	**0**	**0**	**100**	**50**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO305.1. Understand and comprehend basic drawing skills

CO305.2. Read and interpret building drawings

CO305.3. Apply the knowledge to sketch working drawings of residential building

CO305.4. Assess requirements to obtain license for construction & Occupancy Certificate.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO305.1	2	1	2	-	1	1	2
CO305.2	2	1	3	2	2	3	3
CO305.3	3	3	3	3	2	3	3
CO305.4	3	1	3	1	1	2	3
Total	**10**	**6**	**10**	**6**	**6**	**9**	**11**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO305.1	2	3
CO305.2	3	3
CO305.3	3	3
CO305.4	3	3
Total	**11**	**12**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: PRINCIPLES OF PLANNING OF BUILDINGS					
1.1 PRINCIPLES OF PLANNING Principles of planning residential and public building - aspect, prospect, grouping, orientation, privacy, circulation, roominess, sanitation, elegance and economy. Climatic-effects, habits of people and its influence on planning. Effect of furniture and interior requirements.				2	1
1.2 BUILDING BYE-LAWS (GOA) Building bye-laws of plan sanctioning authority in respect of- Plot area (size), setbacks in front, rear and sides, open spaces, plinth area, coverage, built-up area, floor-area ratio, minimum dimensions of different rooms of a building passage, stair, toilets, parking, doors and windows sizes; minimum ceiling-height, head-room, sill-height, basement-height and mezzanines. Following bye-laws for minimum number of toilets, urinals, passage widths, stairs etc. with examples				2	4
1.3 NATIONAL LAWS Purpose, applicability, responsibility of Engineers and Builders in RERA. Overview of NBC.				1	4
UNIT 2: DRAWING OF RESIDENTIAL BUILDINGS					
2.1 DRAWING OF LINE PLAN Drawing of line plans for residential houses				1	2
2.2 DEVELOPMENT OF DRAWINGS Types Of Drawing, Plan, Elevation, Section, Site plan, Location Plan, Roof Plan, Area statement and other details				2	2
2.3 PERSPECTIVE VIEW One point & Two point perspective view				1	2, 3
UNIT 3: DRAWING OF PUBLIC BUILDINGS					

3.1 PRINCIPLES Requirements of different public buildings such as library, community hall, general post-office in municipal area, commercial complexes, school, hotels, hostels, bank, village panchayat building, canteen for institution, health centres. etc		2	1
1.2 DRAWINGS Planning and drawing of above public buildings (line plans only)		1	2
UNIT 4: BUILDING INDUSTRY & PLAN SANCTIONING			
4.1 AGENCIES Different agencies such as architects, service consultants (for electric fittings), sanitary, structural designers, contractors, suppliers, specialist in building services and role of each.		1	4
4.2 AUTHORITIES Plan sanctioning authorities- Panchayat, Municipality, Town planning, Planning and Development Authority		1	4
4.3 PROCEDURES Procedure for submitting plans for approval, sanctioning authorities, number of copies, enclosures of plans, important documents, sales and other details		1	4
UNIT 5: SUB-DIVISION OF PLOTS			
5.1 SUB-DIVISION -Rules & Regulation (Goa/Local) for of sub-division of plots, sub-division for residential & industrial plots		1	3,4
Total	**-**	**16**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Principles of planning of buildings	5	
2	Planning of Residential Building	4	
3	Planning of Public Building	3	
4	Building Industry & Plan Sanctioning	3	
5	Sub-Division of Plots	1	
	Total	**16**	**-**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical	Marks
1	Lines, lettering and materials revision sheet	5
2	Line plan of Residential building(any 2) a. Single storey 2 BHK bungalow b. Duplex 3 BHK bungalow c. Duplex Row house d. 1, 2 BHK flats in a building e. Low cost studio apartments for Lower income group housing scheme.	15
3	Detailed drawing of internal units of the building like-Kitchen, Bedroom, Toilet, W. C. and Bath.	10
4	Planning and designing a residential two storey house from a given data- Framed structure with partly flat and partly pitched roof, plans, elevation, sections, schedule of doors and windows, construction notes, site plan, area statement. Section passing through stair case, Bath and W.C.	20
5	Line plan of Public building (any 2) School a. Hotel/Lodge with Restaurant b. Office cum Shopping Complex c. Primary Health Centre d. Municipality or Panchayat Complex e. School.	10
6	Two point perspective of three steps	10
7	Sub Division of plot	10
No	**Class Room Assignments**	**Marks**
1	Importance sizes for different rooms in building	4
2	Importance sizes for different rooms in School / hotel / commercial / recreational building	4
3	Importance of Building bye-laws of plan sanctioning authority	4
4	Introduction to RERA & NBC	4
5	Roles of Engineer, Architect & Contractor ,Role of different sanctioning authorities & Contents of submission file	4
No	**Tutorial Exercise**	**Marks**
...	**Total**	**100**

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Shah, Kale, Patki	Text Book of Building Drawing	
2	Malik & Mayo	Civil Engineering Drawing	New Asian Publishers New Delhi
3	Y. S. Sane	Planning and Design of Building	
4	M. Chakraboti	Civil Engineering Drawing Including Architectural Aspects	New Asian Publishers New Delhi

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Sikha V B	A course in Civil Engineering Drawing	S K Kataria and sons
2	Rangwala	Civil Engineering Drawing	Charotar Publishing House Pvt. Ltd.
3	D. M. Mahajan	Elements of Building Drawing	Pune vidyarthigrihaprakashan
4		RERA Act.	Govt. Of Goa
5		Regulation of Land Development and Building Construction) Act	Govt. Of Goa

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1	IS 962:	**Code of practice for architectural and building drawings**	Bureau of Indian Standards
2	SP 7	National Building Code (N.B.C)	Bureau of Indian Standards
3	SP: 46-1988.	Section 1 sizes and layout of drawing sheets.	

Internet and Web Resources

S. No.	Web Page / Site	Link	Publishers
1	WizIQ	https://www.wiziq.com/tutorials/civil-engineering-drawing	
2		https://study.com/civil_drafting_course.html	
3		https://freevideolectures.com/subject/civil-engineering/	

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

SEMESTER-IV

Course Code	Name of Course	Teaching Scheme				Examination Scheme				Total Marks
		L	T	P	H	Theory		Practical		
						TH	TM	PR / OR	TW	
CI 401	Surveying II	3	0	3	6	75	25	25	25	150
CI 402	Materials and Structures	3	0	2	5	75	25	0	25	125
CI 403	Hydraulics	3	0	2	5	75	25	0	25	125
CI 404	Computer Aided Civil Engineering	0	0	4	4	0	0	50	50	100
CI 405	Quantity Surveying & Costing	2	0	2	4	75	25	0	25	125
CI 406	Soil Mechanics	3	0	2	5	75	25	0	25	125
	Total	**14**	**0**	**15**	**29**	**375**	**125**	**75**	**175**	**750**
Total Contact Hours - 29 Hours										
L-Lecturers, T- Tutorials, P-Practical, C-Hours, TH-Theory Marks ,TM- Test Marks, PR-Practical Marks, TW-Term Work Marks										
For Training DD - Daily Dairy, PA - Progressive Assessment, TR – Training Marks, SR – Seminar										
Duration of Theory Paper 3 hours										

(CI 401) SURVEYING-II

1. Course Objectives:

The course content has been designed to- Enable the students to acquire skills in handling theodolite in day to day survey work. Provide the students the knowledge of tacheometric survey and modern surveying instruments.

2TEACHING AND EXAMINATION SCHEME

Semester	IV									
Course Code & Course Title		Periods / Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
CI 401 Surveying-II		L	T	P	C	TH	TM	TW	PR/OR	
		3	0	3	6	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO401.1. Understand, use of survey instruments like Theodolite

CO401.2. Apply survey knowledge to set out a simple curve

CO401.3. Calculate horizontal and vertical distance using tacheometer

CO401.4. Select and recommend the modern surveying equipments for surveying practice

4.MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO401.1	2	2	2	1	1	2	2
CO401.2	3	2	2	2	1	2	2
CO401.3	3	2	3	2	1	2	2
CO401.4	2	2	2	3	2	2	3
Total	**10**	**8**	**09**	**8**	**5**	**8**	**9**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO401.1	3	2
CO401.2	2	2
CO401.3	2	2
CO401.4	3	2
Total	**10**	**08**

5.DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: THEODOLITE SURVEY					
1.1 INTRODUCTION (Definition only) Components of Transit Theodolite and Their functions. Technical terms used.. Swinging the telescope, Transiting, Changing the face. Temporary adjustments of Transit Theodolite			6	3	1
1.2 MEASUREMENT TECHNIQUES Measurement of Horizontal angle - method of Repetition, method of reiteration, errors eliminated by method of repetition, Measurement of Deflection angle. Measurement of Vertical angle. Measurement of magnetic bearing of a line by Theodolite. Prolonging a Straight line.			12	6	1
1.3 ERROR ELIMINATION Sources of errors in Theodolite Surveying. Permanent adjustment of transit Theodolite (only relationship of different axes of Theodolite.).			6	5	1
UNIT 2: TRAVERSING COMPUTATIONS					
2.1 TRAVERSE BASICS Traversing with Theodolite – Method of included angles, locating details, checks in closed traverse, Calculation of bearings from angles.			6	4	1
2.2 TRAVERSE COMPUTATION - Latitude, Departure Consecutive Co-ordinates error of Closure, Distribution of a angular error, balancing the traverse by Bow ditch rule and Transit Rule, Gale's traverse table .simple problems on above topic			12	6	1
UNIT 3: TACHEOMETRIC SURVEY					
3.1 TACHEOMETRY Principle of Tacheometry. Essential requirements of Tacheometer. Use of Theodolite as a Tacheometer with staff held in vertical and fixed hair			9	6	3

method (No derivation).Determination of tacheometric constants Simple problems only			
UNIT 4: CURVES			
4.1 INTRODUCTION (Definition only) Types of curves used in road and railway alignments. Notations of simple circular curve. Designation of curve by radius and degree of curves	6	4	2
4.2 SETTING OUT CURVE (Simple problems only) Method of Setting out curve by ordinate from Long chord method and Rankine's method of deflection angles.	6	4	2
UNIT 5: MODERN SURVEY EQUIPMENTS			
5.1 E.D.M Principle of E.D.M, Components of E.D.M, setting up ,measurement, use of E.D.M.	6	3	4
5.2 ELECTRONIC DIGITAL THEODOLITE Features of Electronic Theodolite, operation, its use		2	4
5.3 TOTAL STATION Features of TS Components of total station ,types ,principle, setting up, observation, data processing, limitations and its application	6	5	4
Total	**75**	**48**	

6 COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7 SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Theodolite survey	12	21
2	Traversing Computations	12	21
3	Tacheometric Survey	6	9
4	Curve	8	12
5	Modern Surveying Equipment	10	12
	Total	**48**	**75**

8 SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical (Any 10)	Marks
1	Study of Theodolite, temporary adjustments	2
2	Measurement of horizontal angle	2
3	Measurement of vertical angle	2
4	Measurement of deflection angle	2
5	Prolonging a line	2
6	Traversing with theodolite	2
7	Setting out simple curve by ordinates from long chord	2
8	Setting out simple curve by Rankines method of deflection angle	2
9	Study of EDM and measurements with EDM	2
10	Study of Electronic digital Theodolite ,setting up and taking angular measurements	2
11	Study of Total station, setting up, observation, creating a file	2
No	**Class room Assignments**	**Marks**
1	At least 5 covering all units above	5
No	**Tutorial Exercise**	**Marks**
	Total	25

9.LEARNING RESOURCES:

Text Books

S. No.	Author	Title of Books	Publishers
1		Lecture and Practical Notes on Surveying II for polytechnic students	
2	N. N. Basak	Surveying And Levelling	Tata Mc Graw-Hill
3	Dr. B. C. Punmiya	Surveying And Levelling Part I And II	Laxmi Publication
4	T .P. Kanetkar & S. V Kulkarni	Surveying And Levelling Vol. I And II	Pune Vidhyarthi Griha Prakashan
5	S. K. Duggal	Surveying And Levelling Vol. I And II	Tata Mc Graw-Hill
6	S. K. Husain M. S. Nagaraj	Text Book Of Surveying	S. Chand and Company

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 402) MATERIALS AND STRUCTURES

1. COURSE OBJECTIVE:

The course content comprises of the study of fundamentals of theory of elasticity and the response of the Structural Components when subjected to service loads of tension, compression and shear loading. The study of determination of Moment of Inertia, bending moment and shear force is necessary for determining bending and shear stresses in structural components.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**IV**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
		L	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
CI 402 Materials and Structures		**3**	**0**	**2**	**5**	**75**	**25**	**25**	**0**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO402.1. Identify and Evaluate stresses and strains in simple and composite sections

CO402.2. Establish and Sketch shear force and bending moment diagrams

CO402.3. Analyze and determine moment of Inertia, bending stress and shear stress in beams

CO402.4. Assess and analyse the truss.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO402.1	2	1	1	-	1	-	1
CO402.2	2	3	3	2	1	2	3
CO402.3	3	3	2	2	1	2	3
CO402.4	3	3	3	2	2	2	3
Total	**10**	**10**	**9**	**06**	**5**	**6**	**10**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO402.1	1	1
CO402.2	3	3
CO402.3	3	3
CO402.4	3	3
Total	**10**	**10**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: STRESS, STRAIN AND ELASTIC CONSTANTS					
1.1 FUNDAMENTALS Definition of (rigid body, plastic body, mechanical properties of metal such as elasticity & elastic limit). Stress, strain curve for mild steel and HYSD bar (yield stress/ proof stress, Ultimate stress, breaking stress and percentage elongation).Deformation of body due to axial load. Deformation of a Body subjected to axial forces. Deformation of body of stepped c/s due to axial load, max. stress and min. stress induced. Stresses in bars of composite section & deformation. Shear stress, shear strain & modulus of rigidity.(simple problems on calculation of stress and deformations of simple and composite bars)			6	5	1
1.2 ELASTIC CONSTANTS Definition (stress, Linear strain, lateral strain, Poisson's ratio, Volumetric strain, Young's modulus, ,bulk modulus, Shear stress, shear strain & modulus of rigidity, complementary shear, stress, state of simple shear, punching shear) Classification of stress, Hooke's law, Relation between modulus of elasticity, modulus of rigidity and bulk modulus.(simple problems on calculation of elastic constants)			6	3	1
1.3 .STRAIN ENERGY Definition (strain energy, modulus of resilience and proof resilience).Types of loading (gradual, suddenly applied load & Impact load) stresses due to (gradual load, sudden load and impact load).			4	2	1
UNIT 2: MOMENT OF INERTIA					
2.1 CONCEPTS OF MOMENT OF INERTIA Definitions of moment of inertia, radius of gyration & polar moment of inertia			3	2	3

2.2 MOMENT OF INERTIA OF SECTIONS M.I of plane areas (rectangle, triangle, circle, semicircle and quarter circle) Parallel axis and perpendicular axis theorem, M.I of symmetrical an unsymmetrical sections (I section, T section, channel and angle section), MI of I section with cover plates	10	8	3
UNIT 3: SHEAR FORCE AND BENDING MOMENT			
3.1 FUNDAMENTALS Types of beams (cantilever, simply supported, fixed and continuous) types of loading(point load, uniformly distributed load, uniformly varying load), types of supports for beams, Determinate and indeterminate structures, Concept of shear force and bending moment, sign convention. Relation between bending moment, shear force and rate of loading, concept of sagging and hogging bending moments (no derivations)	6	3	2
3.2 SHEAR FORCE AND BENDING MOMENT DIAGRAMS Analysis of beams (simply supported, cantilever and overhanging beams) subjected to point loads & UDL, construction of shear force diagram, determination of point of contra flexure and construction of bending moment diagram for the above mentioned type of beams (no derivations simple problems)	12	7	2
UNIT 4: STRESSES IN BEAMS			
4.1 CONCEPTS OF BENDING STRESS (no derivations) Concept of pure bending, theory of simple bending, assumptions in theory of bending, neutral axis, bending stresses and their nature, bending stress distribution diagram, moment of resistance.	3	2	3
4.2 CONCEPTS OF SHEAR STRESS (no derivations) Concept of shear stress, Shear stress equation, shear stress distribution for (rectangular, hollow rectangular, circular sections and hollow circular sections) Relation between max. shear stress and average shear stress.	3	2	3
4.3 BENDING STRESSES IN BEAMS (simple problems) Simple problems on calculation of bending stresses and other parameters in rectangular, circular sections and symmetrical I section using simple bending formula	3	2	3
4.4 SHEAR STRESS IN BEAMS (simple problems) Simple problems on calculation shear stress and plotting of shear stress distribution for simple sections (rectangular, hollow rectangular, circular sections and hollow circular sections). Shear stress distribution in I section and T section	6	3	3
UNIT 5 ANALYSIS OF TRUSSES			
5.1 FUNDAMENTALS (**no derivations**) Definition of frames, classification of frames, perfect, imperfect, redundant and deficient frame, relation between members and joints, assumption in analysis, method of determining forces in members of truss, nature of force (compressive and tensile)	3	3	4
5.2 FORCES IN MEMBERS OF TRUSS	10	6	4

Simple problems on method of joints only for simply supported and cantilever truss (of max 6 members unsymmetrical or 12 symmetrical)			
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Elastic Constants and Strain Energy	10	16
2	Moment of Inertia	10	13
3	Shear Force and Bending Moment	10	18
4	Stresses in Beams	9	15
5	Analysis of Trusses	9	13
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

Sr No	Practical (Any 8)	Marks
1	Study of Lab machines.	2
2	Tension test on mild steel	2
3	Tension test on tor steel / deformed bars.	2
4	Izod Impact test on mild steel, brass, copper and cast iron.	2
5	Charpy impact test on mild steel, brass, copper and cast iron.	2
6	Flexural test on timber.	2
7	Flexure test on floor tiles or roofing tiles.	2
8	Shear Test on metal.	2
9	Water Absorption & Compression test (Dry & Wet) on bricks	2
10	Abrasion Test on flooring tiles.	2
No	**Class Room Assignments**	**Marks**
1	At least 5 covering all units above	05

2	Drawing of Shear force and Bending Moment diagrams on Graph Paper (5 Problems)	2
.3	Graphical Solution of Two Problems on simple truss frames	2
No	**Tutorial Exercise**	**Marks**
...	Total	25

9. LEARNING RESOURCES:

Text Books

S. No.	Author	Title of Books	Publishers
1		Lecture and Practical Notes on CACE for Polytechnic Students	
2	S. Bhavikatti	Strength of Materials	Tata McGraw Hill
3	S. B. Junnarkar	Mechanics of Structures volume –I & II	Charotar Publishing House, Anand
4	R. S. Khurmi	Strength of Materials	S. Chand & Company Delhi

Reference books for further study

S. No.	Author	Title of Books	Publishers
1	F. L. Singer	Strength of Materials	Harper Collins Publishers India, Delhi

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(C1 403) HYDRAULICS

1. COURSE OBJECTIVE:

Hydraulics as a branch of fluid mechanics is a basic subject for all branches of engineering disciplines. The subject is designed to teach the students the concepts, principles and procedures of hydraulics for planning, designing, supervising, executing and maintaining of the civil engineering works related to Irrigation, Environmental Engineering System and Transportation Engineering System.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**IV**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
CI 403 Hydraulics		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**0**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO403.1. Understand and discuss, various characteristics and properties of fluid flow

CO403.2. Demonstrate the ability to operate hydraulic machines

CO403.3. Experiment, test and measure fluid flow parameters

CO403.4. Compose, assess and design the most economical sections for channels and pipes.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO403.1	3	1	1	2	-	-	2
CO403.2	2	2	1	3	2	2	2
CO403.3	3	2	2	3	3	2	1
CO403.4	3	2	2	2	3	1	1
Total	**11**	**7**	**6**	**10**	**8**	**5**	**5**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO403.1	2	2
CO403.2	2	2
CO403.3	2	3
CO403.4	2	2
Total	**8**	**9**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: FLUID PROPERTIES AND HYDROSTATICS					
1.1 PROPERTIES OF FLUID (simple problems) Introduction to fluid mechanics and hydraulics, Branches of hydraulics-hydrostatics and hydrodynamics, Definition of fluid, Characteristic of fluid and solids. Physical properties of fluids: Mass density, Weight density, Specific volume, Specific gravity, capillarity, Compressibility, Viscosity, Newton's law of viscosity. Ideal and Real liquids			6	4	1
1.2 HYDROSTATICS (simple problems) Definition of pressure and SI units. Hydrostatic pressure at point, Pascal's law. Variation of pressure in horizontal and vertical direction in static liquid. Pressure diagram.			6	2	3
1.3 CENTER OF PRESSURE (simple problems) Total hydrostatic pressure and centre of pressure, Determination of total pressure & centre of pressure on vertical and horizontal faces (faces such as rectangular, isosceles/equilateral triangular and circular only) of dams, sides and bottom of water tanks			6	4	3
UNIT 2: FLUID FLOW CHARACTERISTICS					
2.1 FLOW (no problems) Concept of flow, Gravity flow and pressure flow. Types of flow – steady and unsteady, uniform and non-uniform, laminar and turbulent. Significance of Reynolds number.			3	2	1
2.2 DISCHARGE (simple problems) Discharge and its units Continuity equation for fluid flow. Datum head, pressure head, velocity head and total head, Bernoulli's theorem, Loss of head.			6	3	3

UNIT 3: FLOW THROUGH PIPES			
3.1 MEASUREMENT OF LIQUID PRESSURE (no problems) Concept of pressure head and its units, Absolute, Gauge and Vacuum Pressure. Conversion of pressure head of one liquid into other.	6	3	1, 3
3.2 PRESSURE MEASUREMENTS DEVICES (simple problems) Piezometer, U-tube manometer, Measurement of pressure difference using differential manometer– U-tube differential manometer and inverted U-tube differential manometer. Bourdon's pressure gauge. (sketch, working Principle and limitations)		4	3
3.3 DISCHARGE MEASURING DEVICES (simple problems) Venturimeter – Component parts, principle of working, Types of orifices. Coefficient of contraction, coefficient of velocity and coefficient of discharge, Relationship between them. Discharge through small sharp-edged circular orifice. Determination of hydraulic coefficient of orifice.	6	4	3
3.4 FLOW THROUGH PIPES (simple problems) Loss of head due to friction, Darcy-Weisbach Equation. Friction factor, relative roughness. Common range of friction factor for different types of pipe material. loss of head due to sudden Contraction, sudden expansion, gradual contraction & expansion, at entrance and exit of pipe in various pipe fittings. Pipes in series and parallel Equivalent pipe	6	4	3
3.5 WATER HAMMER IN PIPES (no problems) Cause, effects and remedial measures.	3	1	1
UNIT 4: FLOW THROUGH CHANNELS			
4.1 CHANNELS (no problems) Types of channels- artificial & natural, Different shapes of artificial channels. Geometrical properties of channel section – wetted area, wetted Perimeter, hydraulic radius Prismatic channel sections, steady-uniform flow through prismatic channel section.	3	2	4
4.2 DISCHARGE THROUGH AN OPEN CHANNEL (simple problems) Chezy's equation and Manning's equation for calculation of discharge through an open channel, common range of values of Chezy's constants and Manning's constant of different types of channel surfaces, most economical channel section, conditions for most economical channel sections.	6	4	4
4.3 FLOW MEASURING DEVICES (simple problems) Velocity measuring devices for open channels: Floats - surface, sub-surface and float rod. Pitot tube – principle, expression for velocity	6	4	4
4.4 DISCHARGE MEASURING DEVICES (no problems) Definition and Types of notches, Francis formula, Definition and Types of Weirs and spillway.	3	2	4

UNIT 5: HYDRAULIC MACHINES			
5.1 HYDRAULIC MACHINES (no problems) Definition and types, definition and types of turbines. Sketch of (Pelton wheel, hydraulic press, hydraulic ram)	3	2	2
5.2 PUMPS (no problems) Pumps - Definition and types. Suction head, delivery head, static head and manometric head. Sketch, Component parts and working (Centrifugal pump, Reciprocating pump) priming of Centrifugal pump	6	3	2
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Fluid Properties and Hydrostatics	10	18
2	Fluid Flow Characteristics	5	9
3	Flow Through Pipes	16	21
4	Flow Through Channels	12	18
5	Hydraulic Machines	5	9
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical (Any 8)	Marks
1	Measurements of pressure and pressure head by Piezometer, U-tube manometer	2
2	Measurement of pressure difference by U-tube differential manometer.	2
3	Study of Bourdon's Pressure Gauge	2
4	Verification of Bernoulli's theorem	2
5	Reynolds experiment to study types of flow.	2
6	Determination of Darcy's friction factor for a given pipe	2
7	Determination of Minor losses in pipes (any two)	2

8	Determination of coefficient of discharge for given rectangular or triangular notch.	2
9	Determination of coefficient of discharge for a given Venturimeter	2
10	Demonstration and use of Pitot tube	2
11	Determination of hydraulic coefficients for sharp edge orifice.	2
12	Study of a model of centrifugal and reciprocating pump.	2
No	**Class Room Assignments**	**Marks**
1	At least 5 covering all units above	9
No	**Tutorial Exercise**	**Marks**
	Total	**25**

9. LEARNING RESOURCES:

Text Books

S. No.	Author	Title of Books	Publishers
1	R. K. Rajput	A Text Book of Fluid Mechanics Hydraulic Machines	S. Chand & Company Ltd. New Delhi
2	Dr. R. K. Bansal	A Text Book of Fluid Mechanics Hydraulic Machines	Laxmi Publications
3	Dr. Jagdish Lal	Fluid Mechanics and Hydraulics with Computer Applications	Metropolitan Book Co Pvt Ltd
4	A K. Jain	Fluid Mechanics (Including Hydraulic Machines)	Khanna Publishers
5	Dr. P. N. Modi & Dr. S. M. Seth	Hydraulics & Fluids Mechanics Including Hydraulic Machines	Rajsons Publications Pvt. Ltd.

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Frank M. White	Fluid Mechanics	Mc Graw Hill
2	Cengel and Cimbala	Fluid Mechanics Fundamentals and Applications	Mc Graw Hill
3	Munson and Young	Fundamentals of Fluid Mechanics	John Wiley and Sons
4	Philip Pritchard	Introduction to Fluid Mechanics	John Wiley and Sons

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 404) COMPUTER AIDED CIVIL ENGINEERING

1. COURSE OBJECTIVES:

A civil engineer should be able to plot and design civil engineering structures using a computer. The market demands frequent changes in product design to suit the customer needs. With the introduction of computers the task of incorporating frequent changes as per requirement is becoming simpler. This course has been introduced at diploma level to develop the skills in the students so that they can generate various digital drawings as required using various CAD software.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**IV**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CI 404 Computer Aided Civil Engineering		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		0	**0**	**4**	**4**	**0**	**0**	**50**	**50**	**100**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO404.1. Recognize and identify use of computer for civil engineering

CO404.2. Apply and interpret to resolve construction management problems using software.

CO404.3 Appraise, experiment, inspect, computer operations effectively

CO404.4. Assess computer software used in civil engineering

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO404.1	2	1	1	2	1	2	3
CO404.2	2	2	2	3	2	3	3
CO404.3	2	1	1	3	1	2	2

CO404.4	2	1	1	3	2	2	3
Total	**8**	**5**	**5**	**11**	**6**	**9**	**11**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO404.1	3	3
CO404.2	3	3
CO404.3	2	2
CO404.4	3	3
Total	**11**	**11**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: FUNDAMENTALS COMPUTER SOFTWARE (*preferable)					
1.1 INTRODUCTION Applications of computers in various civil engineering fields. Need of computers in civil engineering design and execution. Advantages and disadvantages of computers in civil engineering. Future trends in Computer Aided Civil Engineering				3	1
1.2 INTRODUCTION TO WINDOWS ENVIRONMENT Introduction GUI (Graphical user Interface), desktop, Start Menu, Task Bar, Status Bar, Scroll Bar, Title Bar, Toolbars, Menu Bars. In Ms-Windows or LINUX, Applications of MS Windows				4	1, 4
1.3 WORDPROCESSING AND SPREADSHEETS Applications of MS Office , Image processing, Media Processing, Word processing, Spreadsheets				4	1, 4
1.4 PRESENTATION AND INTERNET Presentations, search engines, civil engineering sites, Email, Mobile applications for education (EduApps), Blogs, Academic Sites.				5	1, 4
UNIT 2: DRAFTING SOFTWARE (essential)**					
2.1 INTRODUCTION Study of Various software available like AutoCAD, 3D max, Auto Civil				5	3, 4

2.2 DRAFTING AND PLOTTING Computer Aided Drafted of plan, 2-elevations, section and site plan residential/public buildings and civil engineering structures		10	3, 4
UNIT 3: DESIGN SOFTWARE (*optional)			
3.1 INTRODUCTION Study of Various software available such as STAAD-Pro, STRUDS, SuperCivil		5	3, 4
3.2 STRUCTURAL DESIGN analysis of portal frame, truss, space frame, girders , introduction to FEM, design of beam, Column, footings, retaining walls, slabs		7	3, 4
UNIT 4: PLANNING SOFTWARE (*optional)			
4.1 PLANNING Study of Various software available like MS-Project		5	2, 4
4.2 PROJECT SOFTWARE Networking using CPM/PER T, Bar-chart, Scheduling and costing, Break even analysis, Inventory control		5	2, 4
UNIT 5: OTHER SOFTWARE (*optional)			
5.1 INTRODUCTION Study of Various software available in Hydraulics, Irrigation, Soil, transportation, earthquake etc.		5	4
5.2 TYPES Design and analysis of different Civil engineering structures by available software		6	4
Total		**64**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, laboratory interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Fundamentals Computer Software	16	
2	Drafting Software	15	
3	Design Software	12	
4	Planning Software	10	
5	Other Software	11	
	Total	**64**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	**Practical** (No. 13 to No. 18 essential) (others preferable)	Marks
1	Basic Practice on Windows or Linux Starting - Exploring , moving and sizing of windows, inputting text, saving in and retrieving files, file organization, Recycling, Shutting down and restarting	
2	Practice on Image Processor on Windows or Linux a. Create a vector image logo and save in different formats b. Import and modify vector images (clip-art) of construction activity c. Import and modify raster images of construction activity	
3	Practice on Media Processing on Windows or Linux a. Create a sound file and save in different formats b. Import and modify sound files c. Create a video file of construction activity and save in different formats d. Import and modify video files of construction activity	
4	Practice on Word Processor on Windows or Linux a. Write a formatted letter i. To HOD Civil asking for permission. ii. To construction supplier asking for rates (with tables). iii. For sponsorship of college event on letterhead (insert header/footer/image...) b. Write a formatted report i. For college paper (using fonts, paragraph, editing, columns and change lay-out etc.) ii. For Materials notes (using styles, and insert illustrations, links, equations and symbols) c. Write a visiting card (using text) d. Write a Poster for advertising a cement/waterproofing product (with backgrounds, colours, text-styles, images etc).	
5	Practice on Spread-Sheets on Windows or Linux a. Write a spread sheet to calculate the quantities, rates and total price of any 5 items in a house construction (e.g. concrete, plaster, painting, masonry, and flooring). b. Insert a spread sheet in word processor showing marks in subject and average marks	
6	Practice on Presentations on Windows or Linux a. Prepare a point wise animated presentation and slideshow on any topic in environmental engineering having 25 slides including art, photos, videos, flowcharts, tables – with title slide and conclusion slide.	

7	Introduction to different software used in civil engineering on Windows a. Notes on You tube or other tutorials on various civil engineering software like AUTOCAD-Civil	
8	Create Email Account, send email to each other in class, forward and reply to email.	
9	Use Mobile Apps to search a. for DTE website and results b. for information on (Stone Masonry, Curing of concrete and Dams)	
10	Download text ppt. and images files from the internet to use in exercises 3 to 9	
11	Download a tutorial from the internet	
12	Use Blogs	
13	Plan, Elevation, Section, Schedule of openings, Site Plan and Area Statement, of a residential building.	
14	Plan, Elevation, Section, Schedule of openings, Site Plan and Area Statement of a Public building	
15	Plan, Cross Section and Longitudinal section of a Culvert (Pipe culvert/Box Culvert).	
16	a) Drawing of a railing/window grill. b) Drawing of a window/door	
17	Cross Section of gravity, cantilever, buttress Retaining wall	
18	Bonds in brickwork – Plan and Elevation for English bond and Flemish bond for one Brick thick wall.	
19	Any other as per availability in institution	
	Total	**25**

9. LEARNING RESOURCES:

Text Books

S. No.	Author	Title of Books	Publishers
1		Lecture and Practical Notes on CACE for polytechnic students	
2	B. Ram	Computer Fundamentals Architecture and Organization	New Age International Publisher
3		Introduction to Linux	Tata McGraw Hill
4		Introduction to MS-Dos	Tata McGraw Hill
5		Introduction to MS-Windows	Tata McGraw Hill
6	Henry Lucas	Information Technology for management	Tata McGraw Hill

7	Norton Peter	Introduction to Computers	Tata McGraw Hill
8	Douglas E	The Internet Book	Prentice hall
9		Reference Manual of 3DMax	
10		Reference Manual of Auto Civil	
11		AutoCad Manual	

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1		AutoDesk Reference	
2		Manual of AutoCAD	
3	Felix CAD	Reference Manual of Felix cad	
4		Reference Manual of Intel CAD	

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 405) QUANTITY SURVEYING AND COSTING

1. COURSE OBJECTIVE:

This is core subject in Civil Engineering in which the student would be able to acquire knowledge and skills in measurements of quantities, investigating factors affecting cost of an item of work, and preparing detailed estimates. The student would be able to gain general knowledge and awareness of valuation ,understand the salient features and relevance of tenders and contracts adopted for civil engineering works.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**IV**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
CI 405 Quantity Surveying and Costing		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**
		2	**0**	**2**	**4**	**75**	**25**	**25**	**0**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO407.1. Understand, and prepare material estimates and rate analysis of construction items.

CO407.2. Demonstrate the Practice to take measurements.

CO407.3. Calculate and Estimate cost of building correctly, concisely.

CO407.4. Prepare specifications; compose and compare contract and tender documents.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO407.1	2	1	1	-	1	2	2
CO407.2	2	2	1	2	-	2	2
CO407.3	3	2	2	2	3	3	3
CO407.4	3	2	2	2	3	3	2
Total	**10**	**7**	**6**	**6**	**7**	**10**	**9**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO405.1	3	3
CO405.2	2	2
CO405.3	3	3
CO407.4	3	3
Total	**11**	**11**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: OVERVIEW OF ESTIMATION & COSTING					
1.1 INTRODUCTION Meaning of the terms Estimating, Costing, Purpose of Estimating and Costing			3	1	1
1.2 TYPES OF ESTIMATE Approximate Estimate, Detailed Estimate Revised estimate, Supplementary estimate, Revised & Supplementary estimate, Maintenance & Repair estimate. Types of Approximate Estimate – (Plinth Area Method, Cubic Content Method, Service Unit Method, Typical Bay Method, Approximate Quantity Method)			6	3	1, 2
UNIT 2: MEASUREMENTS & ESTIMATION					
2.1 BASIC MEASUREMENT General Rules for fixing units of Measurements for different items of work as per IS 1200, Standard modes of measurements for different items of work for buildings and road work.			6	2	2
2.2 BASIC ESTIMATION Procedure for taking out quantities for various items of works by Long Wall and Short Wall Method and Center Line Method. (Simple problems) Measurement sheet. Preparation of brief report on estimation			9	5	1
UNIT 3: DETAILED ESTIMATION AND ABSTRACTING					
3.1 PROVISIONS IN DETAILED ESTIMATE Provisions in detailed estimate for Contingencies, Work Charged Establishment, Provisional Items, Provisional Sums, Lump Sum Items, Spot Items, Provision for water Supply & Sanitary works, Electrical			6	3	1

wiring & installations, Centage Charges, Tools & Plants.			
3.2 ABSTRACTING Use of Abstract sheet and latest GSR (buildings) Estimation, Standard Schedule of rates.	6	2	3
3.3. ESTIMATE FOR ROADS Computation of earthwork for Roads with no traverse slope using Mean Area Method and Mean Depth Method. Abstracting, Use of GSR (Roads), Estimation	6	2	3
UNIT 4: RATE ANALYSIS			
4.1 MATERIAL ESTIMATE Definition of Rate analysis, Factors affecting rate, component of rate analysis,), (IS Code: 7272) (to be permitted for use in examination) Market Rate and labour rate. Preparing material estimate for following 4 common items of work. (Earthwork, Concreting, Brickwork and Plastering)	6	2	3
4.2 RATE ANALYSIS Rate analysis of Earthwork, Concreting, Brickwork and Plastering.	6	2	1
UNIT 5: TENDERS, CONTRACTS AND SPECIFICATIONS			
5.1 TENDER Definition of tender, E-tender, tender notice, points to be included while drafting tender notice, Process of tendering, Earnest Money Deposit, Security Deposit, Unbalanced tender, reject one or all tenders, Award of contract, acceptance letter and work order	6	5	4
5.2 CONTRACT Definition and contents of contract document, requirements of valid contract, Brief description of types of contract (lump sum, item rate and percentage rate), class of contractor, registration of contractor, termination of contract	6	3	4
5.3 SPECIFICATIONS Necessity and importance of specifications, framing specifications of 4 items in civil engineering works (Excavation, Concreting, Brick Masonry and Plastering). Legal aspects of specification.	6	2	4
Total	**75**	**32**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Overview of Estimating on and Costing	4	9
2	Measurements & Estimation	7	15
3	Detailed Estimation and Abstracting	7	18
4	Rate Analysis	4	12
5	Tenders, Contracts and Specifications	10	18
	Total	**32**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical	Marks
1	Preparing of a tabular form of Modes of Measurement.	1
2	Preparing a detailed estimate of a RCC single storied residential building (1 BHK) with RCC roof partly flat and partly sloping for all items of work. (should consist of Report, Abstract sheets, Measurement sheets and relevant drawings)	10
3	Taking out quantities of earth work for 500 m road (should consist of Report, Abstract sheets, Measurement sheets, earthwork calculations in tabular form, and relevant Drawings)	5
4	Preparing Rate analysis of 4 items (Excavation, Concreting, Brick Masonry and Plastering).	2
5	Drafting a Notice Inviting Tender	1
6	Writing detailed specifications for Excavation, Concreting, Brick Masonry and Plastering.	1
No	**Class Room Assignments**	**Marks**
1	At least 5 covering all units above	5
No	**Tutorial Exercise**	**Marks**
	Total	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B. N. Datta	Estimating & Costing In Civil Engineering	Ubs Publishers Distributers Ltd.
2	M. Chakraborti	Estimating, Costing, Specification and Valuation in Civil Engineering	Chakraborti
3	S.C. Rangwala	Estimating, Costing and Valuation	Charotar Publication
4	B.S. Patil	Civil Engineering, Contracts and Estimates	Universities Press/ Orient Blackswan Pvt. Ltd.

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	G. S. Birdie	Text book of Estimating and Costing (Civil Engineering)	Dhanpat Rai Publishing Co. Pvt Ltd New Delhi

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1	IS: 1200	Methods of Measurement of Building and Civil Engineering Works	BIS
2	IS:7272	Indian Standard Recommendation for Labour Output Constants for Building Work.	BIS

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI406) SOIL MECHANICS

1. Course Objective:

This course of Soil Mechanics will be able to enable the student to predict the behavior and performance of soil as a construction material and / or as a supporting medium of engineering structures. The study will enable the student to make use of this information in-the design and construction of foundations to various structures, pavements, earth retaining structures, embankments, earth dams etc.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**IV**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
		L	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR / OR**	
CI 406 Soil Mechanics		**3**	**0**	**2**	**5**	**75**	**25**	**25**	**0**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO406.1. Recognize soil as three phase system

CO406.2. Interpret to estimate permeability, shearing strength and bearing capacity of soil

CO406.3. Experiment & test to determine properties of soil

CO406.4. Assess soil related problems and develop appropriate solutions by proper investigations and explorations

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO406.1	2	-	-	-	1	1	1
CO406.2	2	2	2	2	-	3	3
CO406.3	2	3	3	3	3	3	3
CO406.4	2	2	2	3	2	3	2
Total	**8**	**7**	**7**	**8**	**6**	**10**	**9**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO406.1	1	1
CO406.2	3	3
CO406.3	2	2
CO40.4	3	3
Total	**9**	**9**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
UNIT 1: FUNDAMENTALS OF SOIL MECHANICS					
1.1 OVERVIEW Definitions of Soil Mechanics, IS definition of soil, Importance of soil in Civil Engineering as construction material and foundation bed for structures, application soil Mechanics.			6	3	1
1.2 INTRODUCTION TO GEOLOGY Definition of rocks, faults, folds; types of rocks; Typical properties of Lateritic soils found in Goa.				2	1
1.3 PHYSICAL PROPERTIES OF SOIL (no problems) Soil as a three phase system, Definition and determination of (Water content, Void ratio, porosity and degree of saturation, density index, bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight, Specific gravity, Consistency of soil, Liquid limit, plastic limit and shrinkage limit, plasticity index. Particle size distribution, effective diameter of soil, Uniformity coefficient and coefficient of curvature, well graded and uniformly graded soils.)Particle size classification of soils & IS classification of soil.			12	6	3
UNIT 2: PERMEABILITY & SEEPAGE					
2.1 PERMEABILITY Definition of permeability, Darcy's law of permeability, coefficient of permeability, typical values of coefficient of permeability for different soil, Factors affecting permeability, Determination of coefficient of permeability by constant head and falling head permeability tests, (simple problems to determine coefficient of permeability).			9	6	2

2.2 SEEPAGE Seepage through earthen structures, Definition of (seepage velocity, seepage pressure, phreatic line, flow lines and equipotential lines, Flow net), application of flow net (no problems). Sketch of typical flow net through earth dam and below concrete dam	6	2	4
UNIT 3: SOIL STRENGTH			
3.1 SHEAR STRENGTH Shear failure of soil, Concept of shear strength of soil, Components of shearing resistance of soil – cohesion, internal friction, stress strain curve, Mohr-coulomb failure theory, Strength envelope, strength equation, Definition of (cohesive and cohesion less soils) Sketch and procedure of (Direct shear test, Triaxial Shear test, Unconfined compression test & vane shear test)	9	6	2
3.2 BEARING CAPACITY AND SOIL STRESS Definition of bearing capacity, ultimate bearing capacity, safe bearing capacity , allowable bearing pressure ,total stress effective stress Sketch and procedure of (Plate load test and standard penetration test) Typical values of bearing capacity from building code IS: 1904. Importance of Effective stress in Civil Engineering.	6	3	2
3.3 LATERAL EARTH PRESSURE Definition of active earth pressure and passive earth pressure, Rankines earth pressure on walls.		2	4
UNIT 4: SOIL IMPROVEMENT			
4.1 COMPACTION Definition of compaction, Sketch and procedure of (Standard & modified proctor test and CBR test) Definition of (optimum moisture content, maximum dry density, Zero air voids line.) Factors affecting compaction, field situations where compaction is required, Field methods of compaction – rolling, ramming & vibration and Suitability of various compaction equipments. Difference between compaction and consolidation	6	6	4
4.2 SOIL STABILIZATION Concept, necessity, and procedure of Mechanical soil stabilization, lime stabilization, cement stabilization, bitumen stabilization, fly-ash stabilization.	6	3	4
4.3 GROUND REINFORCEMENT (only concepts) Definition of ground reinforcement, type/list of Ground reinforcement techniques, natural Ground reinforcement (jute, coir, roots). Concept of mechanically stabilized walls.	3	2	4
UNIT 5: SITE INVESTIGATION & SUBSOIL EXPLORATION			
5.1 SITE INVESTIGATION Necessity & Types of site investigation, site exploration by open excavation &, Disturbed & undisturbed soil samples for lab testing. List	6	3	3

of tests for Field identification of soil			
5.2 SUBSOIL EXPLORATION Necessity & Types of sub-soil exploration, boring, Criteria for deciding the location and number of bores, SPT and DCPT (only in brief) Empirical correlation between soil properties and SPT values. Soil investigation report and borehole log.	6	5	3
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Fundamentals of soil mechanics	11	18
2	Permeability & seepage	8	15
3	Soil Strength	11	15
4	Soil Improvement	11	15
5	Site Investigation & Subsoil Exploration	8	12
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical (Any 8)	Marks
1	Determination of water content of given soil sample by oven drying method	2
2	Determination of specific gravity of Soil	2
3	Determination of grain size distribution of given soil sample by mechanical sieve analysis	2
4	Determination of Liquid limit, Plastic & Shrinkage limit of given soil sample	2
5	Determination of coefficient of permeability by constant head test	2
6	Determination of coefficient of permeability by falling head test Practical	2
7	Determination of shear strength of soil using direct shear test	2
8	Determination of shear strength of soil using Laboratory Vane shear test	2
9	Determination of MDD & OMC by standard proctor test	2
10	Determination of bulk unit weight dry unit weight of soil in field by core cutter method	2

11	Determination of unit weight dry unit weight of soil in field by sand replacement method	2
12	Determination of CBR	2
13	Determination of shear strength of soil using unconfined compressive strength	2
14	Determination of shear strength of soil using tri-axial shear test	2
No	**Class Room Assignments**	**Marks**
1	At least 5 covering all units above	9
No	**Tutorial Exercise**	**Marks**
...	Total	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Dr. B. C. Punmia	Soil Mechanics & Foundation Engineering	Standard Book house, New Delhi
2	Murthi	Soil Mechanics & Foundation Engineering	Tata McGraw Hill, New Delhi
3	Gulhati & Dutta	Geo-technical Engineering	Tata McGraw Hill, New Delhi
4	P. Purushothama Raj	Soil Mechanics and Foundation Engineering	Dorling Kindersley(India) Pvt. Ltd
5	Braja M Das	Geotechnical Engineering	Global Engineering USA

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Alam Singh	Soil Engineering Theory and Practicals	IBT Publication NewDelhi
2	Braja M Das	Advanced Geotechnical Engineering	Global Engineering USA

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

SEMESTER-V

Course Code	Name of Course	Teaching Scheme				Examination Scheme				Total Marks
		L	T	P	H	DD	PA	TR	SR	
CN 501	Civil Construction Training-I	0	0	30	30	50	50	50	50	Grade
	Total	**0**	**0**	**30**	**30**	**50**	**50**	**50**	**50**	**Gr.**
For Training DD - Daily Dairy, PA - Progressive Assessment, TR – Training Marks, SR-Seminar										

(CN 501) CIVIL CONSTRUCTION TRAINING I

1. COURSE OBJECTIVES:

The students will able to: Acquire knowledge of different terms, concepts and methods employed at a construction site Develop the ability to apply basic methods to solve site problems Execute management plans with precision and Acquire sufficient techniques necessary for daily construction office works

2. TEACHING AND EXAMINATION SCHEME

Semester	**V**						
Course Code & Title			**Theory**		**Practical**		**Total**
			Daily diary	**P A**	**Training Report**	**Seminar**	
CN 501 Civil Construction Training-I			**50**	**50**	**50**	**50**	**200**
		Total	**50**	**50**	**50**	**50**	**200**

3.COURSE OUTCOMES:

On successful completion of the course, the student will be able to:
CO501.1. Understand, and Demonstrate ability to manage and supervise a construction site effectively
CO501.2. Apply, engineering knowledge to Practice, construction site and office operations effectively
CO501.3 Analyze, Inspect and Estimate quantities using quantity surveying,
CO501.4 Propose, Organize and Manage, appropriate solutions to construction site and office problems

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO501.1	3	2	2	-	-	3	2
CO501.2	3	2	2	2	2	3	3
CO501.3	3	2	2	2	-	3	2
CO501.4	3	3	3	3	2	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO501.1	3	3
CO501.2	3	3
CO501.3	3	3
CO501.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**TH = Teaching hours**	**CO = Course Objectives**			
UNIT			**M**	**TH**	**CO**
1 SITE DUTIES					
Students are expected to perform most of the following jobs/assignments/activities during the training period. 1. Fixing site layout/site rail. 2. Marking centreline of column/walls. 3. Carry out masonry operations. 4. Carry out earthwork and rubble packing operations. 5. Carry out concreting operations. 6. Check steel reinforcements in RCC : footings, Columns, beams, slabs, 7. Check structural form-work for shape, size and stability. 8. Call/order for materials. 9. Store the materials. 10. Carry out testing for different jobs. 11. Carry out and record Measurements 12. Prepare Measurement sheet and Abstract sheet. For running and final bill 13. Billing/labour payments. 14. Maintain daily records. 15. Regularly check the schedule and take corrective measures. 16. Carry out flooring works. 17. Carry out painting works. 18. Check electrical works 19. Water-proofing. 20. Carry out and Check Sanitary filling/pipes/internal plumbing works. 21. Temporary services for labour/safety. 22. Carry out Maintenance and Repairs works. 23. Carry out any additional works entrusted to them in relation to the site (interaction with other authorities, banking etc.)			50	Full day	all
2 OFFICE DUTIES					
Students are expected to perform most of the following jobs/assignments/activities during the training period. 1. Carry out and record Measurements 2. Prepare and check Measurement sheet and Abstract sheet. For running and final bill 3. Billing & payments. 4. Maintain office records. 5. Regularly check the schedule and take corrective measures. 6. Prepare Drawings and blue prints. 7. Assist in Building Design. 8. Use Office software (if given) effectively 9. Carry out any additional works entrusted to them (interaction with other authorities, interaction with Site personnel, banking, inventory etc.)			50	Full day	all
		Total	**100**		

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Site duties	-	50
2	Office duties	-	50
	Total		100

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

Intellectual Skill:

- Acquire knowledge of different terms and, concepts employed at a construction site
- Develop the ability to solve construction problems
- Acquire techniques necessary for daily construction office works
- Inspect and Evaluate construction works
- Supervise the building construction activities

Motor Skills:

- Prepare report on training.
- Execute site management plans
- Estimate labour and material requirement for next day's work
- Develop public speaking ability

No	Practical	Marks
	DAIRY AND REPORT ASSESSMENT	
1	The daily dairy shall be signed by the partner/owner/manager/representative of employer every day. If reporting at Institute officially then HODs sign is necessary for that day. The Daily-dairy and Report prepared shall be assessed by the internal examiner/teacher during PA.	50
2	**PROGRESSIVE ASSESSMENT-**	
	The assessment will be done periodically at least three times during training by the teachers in consultation with the industry/trainer.	50
3	**ORALS/VIVA ASSESSMENT -**	
	The appointed examiner shall assess the trainee based on their reports and performance in oral/viva. Marks should be given to his presentation, Confidence, engineering skills, managerial skills and knowledge gained in performing job activities	100
	Total	200
All the students undergoing training should submit- Daily dairy and Training report		
	Daily dairy-	

	The daily dairy should-be maintained in a bound book. It should reflect the day-to-day activities performed by the student (including task, men, materials safety and procedures involved). It should be counter signed by the Sr. Engineer. It will become the basis for writing reports on the complete training. Based on daily dairy students will be able to work out Task work, rate of different items and compare them with market rates and Goa schedule of rates	
	Training Report -	
	2.1 INTRODUCTION The training report should be submitted by the training students should include the following salient points- Certificate from institute, Certificate of training from company, detailed write up as per daily dairy, detailed drawings, working drawings, photographs, safety precautions, techniques for work minimization on site, organizational chart, Importance of project to the society, special methods/techniques/equipment should be separately heightened, environmental aspects. The report should be informative and technical, typed with double spacing on good quality bond paper and bound. Assessment of Training Report be based on Knowledge, Presentation, Quality of contents and Sketches.	
	2.2 REPORT The report shall be in the following format: 1. Synopsis (brief abstract 700 words) 2. Introduction to Company and Site/Office and company structure 3. Role of individual at company/site 4. Work supervised/done e.g. –, plastering, concreting, excavation, waterproofing ..... (min 4 including special works if any) 4.1, Introduction _general description of work from text book 4.2, check list for materials used on site (quantities of cement, lime, aggregates, sand, props, scaffolding stones, water, dowels, string,) 4.3, check list for tools used on site number and type 4.4, check list for labour used on site number and type (mason, fitter, bender, helper, MC, FC...) 4.5, Do-list for work as per textbook (procedure/steps in list form) 4.6, Do-list for work followed on site (procedure/steps in list form) 4.7, Safety precautions taken on site 8. What did I learn? 9. Conclusion 10. Bibliography and references	

	2.3 OTHER PAGES IN REPORT Front page with institute logo Institute Certificate Training organization Certificate Acknowledgement Contents 1. List of topics 1.1. sub topic 1.1. sub topic 1.1. sub topic 2. List of figures and photo graphs 3. List of tables 4. List of drawings/plans	
	References Appendices (plans/ Rates/ ...)	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Civil Dept	Draft of training report	CT Dept APV
2	Civil Dept	Draft of training presentation PPT	CT Dept APV
3	Civil Dept	Daily Dairy	APV

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	B.N. Datta	Estimating & Costing In Civil Engineering	UBS Publishers
2	W. B. Mackay	Building Construction Vol. I to IV	Longman(ELBS)
3	B. C. Punmia	Building Construction	Laxmi Publication

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1	IS 1200	Method of Measurement of building and Civil engineering works	BIS

SEMESTER-VI

Course Code	Name of Course	Teaching Scheme				Examination Scheme				Total Marks
		L	T	P	H	Theory		Practical		
						TH	TM	PR/OR	TW	
CI 502	Analysis of Structures	3	0	0	3	75	25	0	0	100
CI 602	Irrigation Engineering	3	0	0	3	75	25	0	0	100
CI 603	Design of Steel Structures	3	0	2	5	75	25	0	25	125
CN 601	Architectural Engineering	2	0	6	8	0	0	50	100	150
CN 602	Professional & Life Skills	1	0	2	3	0	0	50	75	125
E-I	Elective- I	3	-	2	5	75	25	25	25	150
AC 101	Essence of Indian Knowledge & Tradition	2	0	0	2	-	-	-	-	Gr.
	Total	**17**	**0**	**12**	**29**	**300**	**100**	**125**	**225**	**750**
Total Contact Hours 29 Hours										
L-Lecturers, T- Tutorials, P-Practical, C-Hours, TH-Theory Marks, TM- Test Marks, PR-Practical Marks, TW-Term Work Marks										
Duration of Theory Paper 3 hours										

Minimum Batch Size 10 Students for Grant of Elective

Elective-I	
CI 611	Building maintenance, Repair and Retrofitting
CI 621	Geotechnical Engineering
CI 624	Construction Equipment and Machinery
CN 603	Automation Systems in Civil Engineering

(CI 502) ANALYSIS OF STRUCTURES

1. COURSE OBJECTIVES:

The student will be able to determine the forces acting on a structure and assess the effects of these forces and the behavior of the structure in different conditions. Furthermore, they will be able to develop the cognitive abilities and skills to facilitate the higher level study of design of structures.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VI**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
CI 502 Analysis of Structures		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**
		3	**0**	**0**	**3**	**75**	**25**	**0**	**0**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO502.1. Comprehend, Compute structural responses like deflection & slope for beam by applying differential equations

CO502.2. Interpret, Evaluate fixed end moments, analyze the continuous beam and draw SFD and BMD

CO502.3. Calculate the resultant stresses at the base of the structure due to eccentricity of load and also determine stresses on any inclined plane due to direct stress

CO502.4. Formulate solutions to Estimate strength of columns

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO502.1	2	2	2	2	-	-	2
CO502.2	1	2	2	1	1	2	2
CO502.3	1	1	1	1	-	-	1
CO504.4	1	2	2	2	1	1	1

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO502.1	2	2
CO502.2	1	3
CO502.3	1	1
CO502.4	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
1 SLOPE AND DEFLECTION FOR BEAMS			13	8	1
1.1 Concept of slope and deflection, stiffness of beam 1.2 Relation between slope, deflection and radius of curvature, differential equation (no derivation), double integration method to find slope and deflection of simply supported beam and cantilever beam 1.3 Macaulay's method for slope and deflection, application to simply supported and cantilever beam subjected to concentrated and uniformly distributed load (Cubic equations not to be considered)					
2 ANALYSIS OF BEAMS			13	8	1,2
2.1 Fixed beams 2.1.1 Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam. 2.1.2 Principle of superposition. 2.1.3 Derivation of fixed end moments from first principle for beam subjected to UDL over entire span, central point load, Point load other than mid span. 2.1.4 Application of standard formulae in finding fixed end moments and drawing S.F. and B.M. diagrams for a fixed beam subjected to UDL, Point load, and partial UDL **2.2 Flitched beams** 2.2.1. Concept of Flitched beam 2.2.2 Moment of resistance of Flitched beam(No numericals)					
3 STRESSES			18	10	1,2,3

3.1 Direct And Bending Stresses 3.1.1 Concept of direct and eccentric loads, eccentricity about one principal axis, nature of stresses, maximum and minimum stresses, resultant stress distribution diagram. 3.1.2 Condition for no tension or zero stress at extreme fiber, limit of eccentricity, core of section for rectangular and solid circular cross sections. 3.1.3 Problems on finding the resultant stresses at the base of columns due to eccentricity of loading about one axis and two axis. **3.2 Complex Stress System** 3.2.1 One dimensional and two dimensional stress system 3.2.2 Determination of Normal, tangential and resultant stress on an oblique plane due to application of direct stresses on two mutually perpendicular axis by using analytical and Mohr's circle method (no shear stresses to be considered) 3.2.3 Calculation of stresses on an oblique plane for the above case by using Mohr's circle method(Simple numericals)			
4 MOMENT DISTRIBUTION METHOD	18	14	1,2,3, 4
4.1 Introduction, sign convention 4.2 Carry over factor, stiffness factor, distribution factor. 4.3 Application of moment distribution method for analysis various types of continuous beams including overhanging beams subjected to concentrated loads and uniformly distributed load over entire span having same or different moment of inertia up to three spans and two unknown support moments only, SF and BM diagrams (Supports at same level) 4.4 Application of moment distribution method to single storey single bay symmetrical portal frames, SF and BM diagrams			
5 COLUMNS	13	8	1,2,3, 4
5.1 Definition, classification of columns 5.2 Buckling of axially loaded compression member, Types of end conditions for column, effective length, radius of gyration, slenderness ratio 5.3 Assumptions in the theory of long column Euler's theory, buckling load and Rankine's theory, crippling load , factor of safety, safe load 5.4 Application of Euler's and Rankine's formula for calculating load carrying capacity of solid circular or hollow circular sections and rectangular sections			
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions and exercises.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Slope and Deflection for beams	8	13
2	Analysis of beams	8	13
3	Stresses	10	18
4	Moment Distribution Method	14	18
5	Columns	8	13
	Total	**48**	**75**

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	S.B. Junarkar and Alvai	Mechanics of Structure -Vol I and II	Charotar Publishing House
2	S. Ramanrutham	Theory of structures	Dhanpat Rai& Sons, Delhi
3	S. B. Junnarkar	Mechanics of structures	Charotar Publishing House, Anand
4	B.C. Punmia	Analysis of Structures	Laxmi Publications, New Delhi

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Dr. B.C. Punmia	Theory of Structures	SBH, New Delhi
2	P. V. Warnock	Strength of Materials	London –Pitman-1943
3	Singer	Strength of Materials	Harper Collins College Div
4	B.B. Lord	Strength of Materials	Newage International New Delhi
5	O.P. Jain and B.K. Jain	Theory and analysis of Structures	New Chand and Bros 1957

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 602) IRRIGATION ENGINEERING

1. COURSE OBJECTIVES:

This course is primarily responsible for providing well planned and systematic facilities for the development of agriculture; water shed management and efficient water distribution. The student is expected to gain knowledge of major and minor irrigation schemes, dams and its related structures.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VI**								
Course Code & Course Title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
CI 602 Irrigation Engineering		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**0**	**3**	**75**	**25**	**0**	**0**	**100**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO602.1. Identify and Accumulate data needed for irrigation concisely and effectively

CO602.2. Practice and Operate, irrigation procedures effectively

CO602.3.Analyze and Estimate capacity of Canals and reservoirs

CO602.4. Create and Plan appropriate solutions to irrigation problems

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO602.1	1	-	-	1	1	1	1
CO602.2	2	2	2	-	2	2	2
CO602.3	1	2	1	2	1	1	1
CO602.4	3	1	1	3	1	1	1

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO602.1	2	2
CO602.2	1	1
CO602.3	2	2
CO602.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: FUNDAMENTALS OF IRRIGATION					
1.1 INTRODUCTION Necessity and importance of irrigation. Advantages and disadvantages of irrigation. Types of Irrigation -flow and lift, perennial and inundation, direct and storage irrigation. Single and multipurpose projects. Investigation for irrigation project- Preliminary and detailed engineering surveys. Geological and hydrological surveys.			9	6	1
1.2 HYDROLOGY Definition of hydrology and hydrologic cycle. Rainfall-factors affecting rainfall, measurement of rainfall by Symon's rain gauge, Arithmetic average method, and Isohyetel method of calculation of average annual rainfall over a basin. Definition of Catchment area Run-off. Factors affecting runoff.			6	4	1,2
UNIT 2: WATER REQUIREMENTS					
2.1 INTRODUCTION Cropping seasons in Goa, Definitions of kharif, rabi, and perennial Crop seasons with their crop period.			3	1	1,2
2.2 WATER REQUIREMENTS Definitions of Duty, Delta, Crop period, Base-period, time factor, capacity factor, intensity of irrigation, Gross Commanded Area, Culturable Commanded Area, un-culturable commanded area . Relation between duty and delta (no derivation). Factors affecting duty, methods of improving duty. (Simple problems in calculation of discharge of canal from crop water requirement and finding the reservoir capacity or tank considering the losses and crop water requirements.)			9	5	1,2,3
UNIT 3: MAJOR WORKS					

3.1 STORAGE RESERVOIR Functions of storage reservoir, factors to be considered for the selection of site for a reservoir. Definition (Bed level, lowest supply level, max water level, High Flood Level, flood lift, free board, top of bund-level, water shed area, dead storage, live storage, gross storage). Sedimentation in reservoirs. List of losses in reservoir.	6	4	2,3
3.2 CONCRETE DAMS Definition of a dam, classification and types of dams, Forces acting on a gravity dam, Types of failures of gravity dams (sliding, overturning and tensile or crushing failures), Function and position of (Openings, drainage gallery, other galleries, and Joints) in gravity dams.	6	4	3,4
3.3EARTH DAMS Types of Earth dams, cross-sections of earth and rock fill dams (with filter blanket, core, toe protection, cut-off, etc) suitability and limitations of earth dams. Types of failure of earth dams: Remedial measures for strengthening dams.	6	4	3,4
3.4 SPILLWAYS AND GATES Section and location of (straight drop, ogee type, duck bill type) spillway. Types of gates and Energy dissipaters used in dams (sketches only).	6	4	2,4
UNIT 4: MINOR WORKS			
4.1 MINOR IRRIGATION SCHEMES Necessity and importance of Percolation Tanks, sketch of Layout of lift irrigation scheme Section and Difference between weir and barrage, Layout and component parts of Bandhara	6	4	4
4.2 BUNDS OF GOA Khazan lands. Functions, construction, layout, of bunds. Traditional sluice-gates(manos), advantages of bunds, Traditional rainwater harvesting using Bunds	6	4	4
UNIT 5: DISTRIBUTION WORKS			
5.1 CANALS Classification of canals, factors to be considered during alignment, Typical cross-sections of canal in (cutting, embankment, partial cutting and partial embankment). Necessity and types of Canal lining, maintenance of canals.	6	4	3
5.2 CROSS DRAINAGE WORKS Definition of C.D works, sketch of (Canal over a drain, Drain over a canal, Canal and a stream at same level, canal falls, escapes, outlets, cross regulators).Aquaduct and super passage	6	4	3
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

nit No	Unit	Number of lectures	Marks
1	Fundamentals of Irrigation	10	15
2	Water Requirements	6	12
3	Major Works	16	24
4	Minor Works	8	12
5	Distribution Works	8	12
	Total	**48**	**75**

8. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B.C. Pumnia, Pande, & B.B.Lal	Irrigation and Water Power Engineers	9th-Standard Probe Distributors Delhi-6
2	N.N. Basak	Irrigation Engineering	McGraw Hill Education
3	Souza et al	Stability of Bunds of Goa	IGC proceedings 2016
4	S. K. Garg	Irrigation Engg. and Hydraulic Structures	Khanna publisher, New Delhi 6
5	B.C.Punmia	Irrigation Engineering	Laxmi Publication, Delhi
6	Varshney S.C Gupta	Theory and Design of Irrigation Engineering and hydraulic structures	Oxford IBH Pub. Co. Delhi

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	L G Dahigaonkar	Textbook of Irrigation Engineering	Asian Books Private Limited
2	Birdi & Das	Irrigation Engineering	Dhanpat Rai
3	Bharat Singh	Fundamentals of Irrigation Engg	Nanchand and Bros, Rorkee

(CI 603) DESIGN OF STEEL STRUCTURES

1. COURSE OBJECTIVES:

This course content is designed with which the student will be able to design the steel structural members subjected to designed force, and prepare detailed structural drawing along with welded connections as per the latest IS Code.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VI**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
		L	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
CI 603 Design of Steel Structures		**3**	**0**	**2**	**5**	**75**	**25**	**25**	**0**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO603.1. Identify structural steel section used in design of steel structures

CO603.2. Analyze and design axially loaded tension member with end connection

CO603.3. Analyze and design structural steel member subjected to compressive loads and transverse load

CO603.4. Estimate the loads on roof truss and design the members of roof truss

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO603.1	2	2	2	2	1	1	1
CO603.2	1	2	2	1	1	2	1
CO603.3	1	2	2	1	1	-	1
CO603.4	1	2	2	1	2	2	1

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO603.1	2	3
CO603.2	1	2
CO603.3	1	2
CO603.4	2	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: STEEL STRUCTURES			**13**	**8**	**1,2**
1.1 INTRODUCTION TO STEEL STRUCTURES Applications of structural steel. Sections used in structural steel. (Introduction to steel tables) Grades of steel and strength characteristics; Types of loads on structural steel. Advantages and disadvantages of steel structures. Use of steel table and relevant IS 800-2007.					
1.2 WELDED CONNECTIONS 1.2.1 Types of end connections, Comparison of welded, bolted and riveted joints. Types of welds and welding symbols. 1.2.2 Advantages and disadvantages of welded joint. Strength of welded joint. 1.2.3 Simple Numerical problems on strength of fillet welded joint subjected to axial load.					
UNIT 2: TENSION MEMBERS			13	8	**2,3**
2.1 Examples of tension members in civil engineering structures 2.2Design strength of tension member , design strength due to yielding of gross section, design strength due to rupture of critical section, s\design strength due to block shear as per IS 800-2007, 2.3Slenderness ratio of tension member as per IS 800-2007. 2.4 Numerical for analysis and design of tension member with fillet welded end connection as per IS code using single angle section, double angle section on same side or opposite side of gusset plate and single channel section					
UNIT 3: COMPRESSION MEMBERS			18	12	**1,3**

3.1 INTRODUCTION 3.1.1 Introduction to compression members – columns and struts, sections used 3.1.2 Classification of cross-section, effective length, slenderness ratio and buckling class as per IS 800-2007, 3.1.3 Design compressive stress as per IS 800-2007 (Tables on fcd based on based on buckling class and slenderness ratio), 3.1.4 Design procedure for compression member – strut and columns (As per Code), 3.1.5 Introduction to column bases, types of column bases, design procedure for slab base foundation with PCC pedestal only. **3.2 DESIGN** 3.2.1 Numerical for analysis and design of angle strut (single and double section) based on3.1.4(with fillet welded connection), 3.2.2 Numerical for analysis and design of single ISHB section for column , 3.2.3 Numerical on design of slab base foundation under column made up of single H section based on 3.1.5 (with fillet welded connection)			
UNIT 4: FLEXURAL MEMBERS	13	8	1,2,3 ,4
4.1 INTRODUCTION 4.1.1 Types of sections, classification of cross sections as per Table 2 IS 800-2007, 4.1.2Laterally supported and laterally unsupported beams, 4.1.3 Bending strength, shear strength, web buckling, web crippling, deflection limits for laterally supported beams, 4.1.4 Design procedure for rolled steel beams (laterally supported beams only) 4.2 DESIGN(Laterally supported beams) 4.2.1 Numerical on section classification as per IS code (for any given rolled steel beam section) 4.2.2 Numerical on analysis and design of simply supported beam of single I section for given UDL or UDL and Point load (moment capacity, shear strength, check for web buckling and crippling and Deflection)			
UNIT 5: ROOF TRUSSES	18	12	**1,2,3 4**

5.1 INTRODUCTION 5.1.1 Types of steel roof truss & its selection criteria. Types of roof coverings. Loads coming on the roof. Introduction to IS 875 part 1,2,3 1987 5.1.2 Calculation of panel point load for Dead load; Live load and wind load as per I.S. 875-1987. 5.1.3 Determination of forces in roof truss by graphical method. Design procedure of members of steel truss with welded connections. 5.1.4 Design procedure of purlins and end bearing of truss. **5.2 DESIGN** 5.2.1 Simple problem on finding panel point loads (DL, LL and Wind load) for give span and configuration of truss 5.2.2 Numerical on analysis and design of members of roof truss for given load (Principal rafter, main tie using double angle sections with welded end connection). 5.2.3 Numerical on analysis and design of purlin for given dead load , live load and wind load (Angle purlin only)			
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Steel Structures	8	13
2	Tension Members	8	13
3	Compression Members	12	18
4	Flexural Members	8	13
5	Roof Trusses	12	18
	Total	**48**	**75**

8.SPECIFICATION TABLE FOR TERMWORK AND PRACTICAL HOURS

No	Term work	Marks
1	**Sketch Book**	10
	Sections used for structural steel design	
	Types of welds and welding symbols	
	Cross sections used as tension members	
	Sketching of design of axially loaded tension with welded end connection	
	Cross sections used in design of columns and struts	

	Sketching of design of axially loaded strut with welded end connection	
	Sketching of column bases : Slab base and Gusseted base	
	Types of roof trusses	
2	**Design of roof truss with suitable configuration for span between 8m to 10m**	10
	Drawing sheet 1: Finding the forces in the members of the roof truss for panel point loads(DL, LL and Wind load) using graphical method	
	Drawing sheet 2: Detailing of Roof truss with joint details and base plate details	
3	**Class room Assignments**	5
	At least 4 problems on each unit given above	
	Total	**25**

9. LEARNING RESOURCES

S. No.	Author	Title of Books	Publishers
1	S K Duggal	Limit state Design of Steel Structures Second Edition	McGraw hill education (India) Pvt. Ltd. New Delhi
2	S.S Bhavikatti	Design of Steel Structures (Fourth Edition) By Limit state method as per IS:800-2007	I.K.International Publishing house Pvt.Ltd
3	N. Subramanian	Design of Steel Structures (Based on IS 800-2007) Edition 2016	Oxford University Press, New Delhi
4	M.R.Shiyekar	Limit state design in Structural Steel (Second Edition)	PHI ISBN-13:978-8120347847

IS Codes

1. IS 800-2007 “Code of practice for general construction in steel” Bureau of Indian standards, NewDelhi
2. IS 875(Part 1):1987 “ Code of practice for design loads for building and structures Part 1 Dead loads,Bureau of Indian standards, New Delhi
3. IS 875(Part 2):1987 “ Code of practice for design loads for building and structures Part 2 Live loads,Bureau of Indian standards, New Delhi
4. IS 875(Part 3):1987 “ Code of practice for design loads for building and structures Part 3 Wind load,Bureau of Indian standards, New Delhi.
5. SP-6.1 ISI Handbook for Structural Engineers.

Steel table

Steel Tables by S. Ramamrutham, Dhanpat Rai publishing company ltd., New Delhi

(CN 601) ARCHITECTURAL ENGINEERING

1. COURSE OBJECTIVES:

The students will able to: Plan commercial and public buildings for specific purpose. Draw working drawings considering the functional requirements. Develop advanced skills in building graphics. Read, interpret and draw the building drawings

2. TEACHING AND EXAMINATION SCHEME

Semester	**VI**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CN 601		**L**	**T**	**P**	**C**	**TH**	**TM**	**TW**	**PR/OR**	
Architectural Engineering		**2**	**0**	**6**	**8**	**0**	**0**	**100**	**50**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:
CO601.1. Comprehend, Construction Drawing skills and Knowledge
CO601.2. Demonstrate, Skills in Preparation of Drawings of buildings
CO601.3 Acquire Skills in perspective drawing and model making,
CO601.4 Formulate, and Plan external town and country planning

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO601.1	2	-	-	2	-	1	1
CO601.2	2	1	1	2	2	1	2
CO601.3	1	-	-	2	-	2	2
CO601.4	3	1	1	2	2	2	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO601.1	3	3
CO601.2	3	3
CO601.3	3	3
CO601.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**TH = Teaching hours**	**CO = Course Objectives**		
UNIT 1: PLANNING AND DRAWING OF MULTI-STOREY BUILDINGS			**TH**	**CO**
1.1 INTRODUCTION Introduction to Vastu-sashtra, Introduction to Fengshui, Sky-scrapers & high-rises, Underground city concept, Modular planning			3	1
1.2 RESIDENTIAL BUILDINGS Plan, statement and other details for large residential homes and multi-storied buildings.			2	1
1.3 PUBLIC BUILDINGS Plan, statement and other details for multi-storied public buildings			2	1
UNIT 2: FACADE TREATMENT				
1**.1 INTRODUCTION** Facade treatment, carvings, mouldings, artefacts, ornaments, materials and finishes			2	2
1**.2 MODERN FACADES** Modern facades for multi-storey buildings			2	2
1.3 TRADITIONAL FACADES Traditional facades from Indian Subcontinent, Traditional Goan House with razangon, Ancient Goan Temple or Church			2	2
UNIT 3: LANDSCAPING				
3.1 INTRODUCTION Principles, planning, purpose, & functions of landscaping and parking.			2	4
3.2 LANDSCAPING **Landscaping** for public, recreational and residential purposes			2	4
3.3 PARKING Parking layouts for public, recreational and residential purposes			2	4
UNIT 4: TOWN PLANNING				
4.1 SUBDIVISION Different sizes of plots for different purposes, Principals of subdivision, open spaces, access, amenities. Subdivision Plan of a plot in rural and urban area.			2	4
4.2 SMART CITY CONCEPT Concept of Smart City, Principles, requirements & planning of Smart City			2	4
4**.3 URBAN PLANNING** Principles of urban planning, twin and satellite cities, underground cities, Plan of a modern township for 2000 residents			2	4
4.4 RURAL PLANNING Principles of rural planning, model village, Plan of a rural development for 500 residents			3	4
UNIT 5: ADVANCED SKILLS				
5.1 PERSPECIVE DRAWING Two-point perspective view of a 3-storey residential/commercial complex with flat roof			2	3

5.2 MODELS Preparation of model of a duplex bungalow with furnishing, compound, garden and pool	2	3
Total	**32**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures
1	Planning and drawing of multi-storey buildings	7
2	Facade treatment	6
3	Landscaping	6
4	Town planning	9
5	Advanced skills	4
	Total	32

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

Intellectual Skills:

1. Read and interpret the building drawings
2. Plan residential and public buildings
3. Apply the building rules, regulations and byelaws.
4. Formulate parking plans

Motor Skills:

1. design landscaping
2. plan and draw Buildings and developments
3. Create models of houses.
4. Sketch facades

No	Practical	Marks
	All Plans, Elevation, Section, Site plan, Area statement and other details for any 1 a. Traditional Goan House with courtyard. b. Ancient Goan Temple or Church	5
	All Plans, Elevation, Section, Site plan, Area statement and other details for any 1 c. Single storey 3 BHK Spread Farm House d. G+ 1 3 BHK bungalow e. G+2 storey residential building	5

	Floor Plans/Layout for any 1 a. Hostel block for IIT/NIT Goa b. Multi-facility parking cum commercial building for Kadamba Bus Depot – with rooftop helipad c. Shopping Mall, with Cineplexes, restaurants, kids zones etc.	5
	Landscaping for any 1 a. Public Garden cum Children Park, b. Factory building with rain water harvesting, c. Bungalow with swimming pool,	5
	Parking layout for any 1 a. Medical College b. School Complex c. 150 room Hotel d. 10,000 capacity Stadium	5
	Subdivision Plan of a plot 1000 m^2 in rural and urban area	5
	Plan of a smart-township for 5000 residents with all utilities and amenities or Plan of a development for 500 resident rural community with all utilities and amenities	5
	Two point perspective view of a 3 storey building complex with flat roof	5
	Preparation of model of a duplex bungalow with furnishing, compound, garden and pool	10
No	**Class room Assignments (Any 5)**	**Marks**
1	Introduction to Vastu-sashtra, ,	5
2	Introduction to Fengshui,	5
3	Requirements Sky-scrapers V/s high-rises,	5
4	Underground city concept	5
5	Modular planning	5
6	Principals of subdivision	5
7	Concept of Smart City	5
8	Principles, planning, purpose of landscaping	5
9	Model village	5
10	Requirements of Parking	5
No	**Sketch-book Exercise**	**Marks**
1	3 Carvings used on Facades	9
2	3 Mouldings used on Facades	9
5	1 facade of modern Building	7
	Total	100

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Shah, Kale, Patki	Text Book of Building Drawing	
2	Malik & Mayo	Civil Engineering Drawing	New Asian Publishers New Delhi
3	Y. S. Sane	Planning and Design of Building	
4	M. G. Shah, C.M. Kale S.Y. Patiki	Building construction	Tata McGraw Hill

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Sikha V B	A course in Civil Engineering Drawion	S K Kataria and sons
2	Chakraboti	Civil engineering drawing including Architectural aspects	Chakraborti
3	D. M. Mahajan	Elements of Building Drawing	Pune Vidyarthi Griha Prakashan

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1	Bousmaha Baiche & Nicholes Walliman	Newfert – Architects	Black Well Science

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CN 602) PROFESSIONAL AND LIFE SKILLS

1. COURSE OBJECTIVES:

To nurture the confidence in self ability and Develop the team work culture through personality development and problem-solving ability.

2. TEACHING AND EXAMINATION SCHEME

Semester VI									
Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
CN 602 Professional & Life Skills	L	T	P	C	TH	TM	TW	PR/OR	
	1	0	2	3	0	0	75	50	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO 602.1. Identify and Practice Information Search

CO 602.2. Demonstrate ability to study and Apply skills to perform given tasks effectively

CO 602.3 Analyse self-potential and develop self and others while solving problems,

CO 602.4 Organize work and develop self and team using Social Skills and Interpersonal Relationships

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledg	Problem Analysis	Design and Devlopme nt of	Engg. Tools, Experime ntatn&	Engg. Practices for Society,Su stainabilit y &	Project Managem ent	Life -long Learning
CO 602.1	2	1	1	2	-	1	2
CO 602.2	2	2	3	1	3	3	3
CO 602.3	2	3	3	3	3	3	2
CO 602.4	2	3	3	3	3	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Managemen t and Design
CO 602.1	2	2
CO 602.2	3	3
CO 602.3	3	3
CO 602.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**TH = Teaching hours**	**CO = Course Objectives**		
UNIT 1: INFORMATION DEVELOPMENT			**TH**	**CO**
1.1 INFORMATION SEARCH Primary, secondary, tertiary Print and non – print, documentary, Electronic Information centre, Library, exhibition, Government Departments.			1	1
1.2 DATA COLLECTION Process of searching, collection of data – (questionnaire, taking interview, observation method, internet, books, proceedings of technical conferences)			1	1
1.3 NOTE KEEPING Notes and reports, Multi pass method of note keeping, Journaling, Tagging notes.			1	1
1.4 INFORMATION PRESENTATION Letters, (Personal, Enquiry, Order, Complaint, Permission, to Civil Authorities, Quotation, ...) Seminars,			1	2
UNIT 2: SELF ANALYSIS AND SELF DEVELOPMENT				
2.1 SELF ANALYSIS Understanding self— (Attitude, aptitude, assertiveness, self-esteem, Confidence buildings. Concept of motivation)			1	3
2.2 SELF CONTROL Concept of Emotion, Types of Emotion, Controlling Emotion, Emotional Intelligence. Anger Management, Concept of SWOT, how to make use of SWOT			1	3
2.3 SELF DEVELOPMENT Creativity-Concept, Factors Enhancing Creativity). Goal Setting (Concept, Setting Smart Goals) Stress Management (Concept, causes, effects, remedies to Avoid /minimize stress.) Health Management (Importance, dietary guidelines and exercises).			1	3,4
UNIT 3: EFFECTIVE STUDY HABITS				
3.1 MEMORY AND CONCENTRATION Ways to enhance memory and concentration.			1	2,3
3.2 READING & LEARNING SKILLS Developing reading skill. Organisation of knowledge, Model and methods of learning, Effective learning techniques			1	2,3
UNIT 4: SOCIAL SKILLS, INTER PERSONAL RELATION AND WORKING IN TEAMS				
4.1 SOCIAL SKILLS Society, Social Structure, Develop Sympathy and Empathy, Sources of conflict, Resolution of conflict, Ways to enhance interpersonal relations.			1	3,4
4.2 INTERVIEW SKILLS Letters, techniques for answering interviews, self-presentation, interaction with interview panel.			1	3,4
4.3 WORKING IN TEAMS Understand and Work Within Groups Dynamics. Working Effectively in Teams, Establish Good Rapport, interest with others and work effectively with them to meet common objectives, Providing and accepting feedback in a constructive and considerate way, Leadership in teams, Handling frustrations in group.			1	3,4

UNIT 5: PROBLEM SOLVING AND MANAGEMENT		
5.1 PROBLEM SOLVING TECHNIQUE.	1	3
Trial and error, Brain storming, Lateral thinking		
5.2 STEPS IN PROBLEM SOLVING Identify and clarify the problem, Information gathering related to problem, Evaluate the Evidence, Consider Alternative Solutions and their Implications, Choose and Implement the Best Alternative, Review.	1	3
5.3 TASK MANAGEMENT Types of tasks, Task Identification, Task Planning, Organizing and Execution, Closing the Task.	1	4
5.4 TIME MANAGEMENT Task work, Time Planning, managing Time. Importance, Process of time planning, Urgent Vs importance, Factors leading to time loss and ways to handle it, Tips for effective time management.	1	4
Total	**16**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures
1	Information Search	4
2	Self-Analysis and Self Development	3
3	Effective Study Habits	2
4	Social Skills, Inter Personal Relation and Working in Teams	3
5	Problem Solving and Task Management	4
	Total	16

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

Intellectual Skill:

1. Develop reading skills
2. Develop team work and assertive skills.
3. Analyse yourself and set the goal for personal development.
4. Enhance creativity, memory and concentration skills

Motor Skills:

1. Prepare report on industrial visit.
2. Apply techniques of effective time management.
3. Apply the techniques of enhancing the memory power.
4. Develop good habits to overcome stress and face problems with confidence

No	Practical (min 15)	Marks
1	Data collection for a given construction job from library books and internet sources	5
2	Data collection for a given construction job from field or market survey	5
3	Creative thinking exercises- how will you do the job differently and better	5
4	10-minute Reading and recalling challenge -200-word passage	5
5	SWOT analysis of yourself	5
6	SWOT analysis of a given construction job	5
7	Work Within Groups for organising a Cultural/Social activity	5
8	Solving a given construction Problem and write a report including Introduction Causes Solution Consultancy charges	5
9	Task Identification, Task Planning for given construction job	5
10	Time Planning for given construction job	5
11	Note keeping exercise (glance / observe / note salient points) on topic from building construction syllabus	5
12	Letters: Personal - to a friend inquiring for a job opportunity in his area	5
13	Letters: Enquiry of goods & equipment & services	5
14	Letters: Order of goods & equipment & services	5
15	Letters: Complaint against wrong construction practice in your area	5
16	Letters: Permission for leave of absence from HOD / manager	5
17	Letters: to Civil Authorities (Panchayat / Municipality / PWD) for starting & completion of works	5
18	Letters: Quotation to prospective client for goods/ equipment/ services (rates attached)	5
19	Interview for a job (on construction site/office) exercise	5
20	Seminar on topic from building construction syllabus	5
	Total	**75**

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Marshall Cooks ,	Adams Time management	Viva Books
2	E.H. Mc Grath , S.J.	Basic Managerial Skills for All	Pretice Hall of India, Pvt Ltd
3	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.
4	Lowe and Phil Kogan	Creativity and problem solving	Page (I) P Ltd

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Jayakaran	Every ones guide to effective writing	Apple publishing
2	Adair, J	Decision making & Problem Solving	Orient Longman
3	Bishop Sue Kogan	Develop Your Assertiveness	Page India

Internet and Web Resources

S. No.	Author	Title of Books	Publishers
1		http://www.mindtools.com	
2		http://www.stress.org	
3		http://www.ethics.com	
4		http://www.coopcomm.org/workbook.htm	
5		http://www.abacon.com/commstudies/interpersonal/indisclosure.htm	
6		http://eqi.org/	
7		http://bbc.co.uk/learning/courses/	
8		http://www.learningmeditition.com	
9		http://www.mapfornonprofits.org/	

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 611) BUILDING MAINTENANCE, REPAIR AND RETROFITTING

1. COURSE OBJECTIVES:

All Civil Engineering structures such as buildings, roads, bridges, dams, canals etc. require routine maintenance and repairs in achieving their desired life span. Lack of maintenance may lead to improper performance or even failure of structure of structure leading loss of economy and even life. Hence it is very essential to study the importance of methodology of maintenance, repairs and retrofitting of various civil engineering structures.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VI**								
Course Code & Course Title		**Periods / Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
CI 611 Building Maintenance, Repair and Retrofitting		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO611.1. Recognize, need to maintain, repair and retrofit units in a building

CO611.2. Apply and operate to carry out repair and retrofitting of masonry concrete structures

CO611.3 Appraise and Inspect, the defects and estimate the need for repairs

CO611.4. Organize, Manage, and Plan necessary maintenance

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO611.1	2	-	-	2	2	2	2
CO611.2	2	2	2	2	2	2	2
CO611.3	2	2	2	2	2	2	2
CO611.4	2	1	1	3	3	3	3

Relationship : Low-1 Medium-2 High-3

	PSO 1	PSO 2
	Construction Planning and Practice	Construction Management and Design
CO 611. 1	2	2
CO 611.2	3	3
CO 611. 3	3	3
CO 611.4	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: INTRODUCTION					
1.1 BASICS Definition of Maintenance, Repairs, Retrofitting, Replacement, Upgrading. Planned Maintenance, Preventive Maintenance, Corrective Maintenance, Survey of Existing Conditions, Maintenance Strategy, Maintenance Budget and Replacement Reserve, Maintenance Cycle.			6	4	1
1.2 NECESSITY OF MAINTENANCE, REPAIR AND RETROFITTING Necessity of maintenance, repair and retrofitting. Causes of Damage, Determining the Cause of Damage, Evaluate the Extent of Damage, Evaluate the Need to Repair, Select the Repair Methods and Materials.			6	4	1,2
1.3 CHEMICALS AND MATERIALS FOR REPAIR: Construction Chemicals, Concrete Repair Chemicals, Special Materials used for Repair of Buildings			6	2	1,4
UNIT 2: MASONARY					
2.1 DEFECTS AND REPAIRS Causes and Repair of Cracks, Dampness and Efflorescence in masonry			9	2	1,4
2.2 RETROFITTING OF NON-ENGINEERED MASONARY Integral Box action, strengthening of walls of buildings made of Rubble masonry. Strengthening by Injection Grouting, Ferro cement and FRP strips. Retrofitting roofs and floors. Strengthening of masonary foundations – shoring, underpinning walls.				4	1,3,4
2.3 RETROFITTING OF ENGINEERED MASONARY Strengthening of existing walls and wall joints. Defects in Paints, repair. Defects in Plaster, Repairs. Defects in flooring – types such as IPS, Mozaic, Ceramic, vitrified - repair.			6	4	1,3,4

UNIT 3: CONCRETE			
3.1 DAMAGE TO CONCRETE Defects in Concrete units - Sulfate Deterioration. Alkali-Aggregate Reaction, Abrasion-Erosion Damage, Cavitation Damage, Corrosion of Reinforcing Steel, Acid Exposure, Cracking, Structural Overloads. Reinforcement corrosion, Corrosion mechanisms.	6	3	1,2
3.2 PROTECTION AND REPAIR OF CONCRETE Necessity of protection and repair of concrete structures. Repair mortars, Protective surface treatments, Cathodic protection systems. Crack repair methods, Repair of rain water leakages. Repair of Valley gutters of sloping roofs. Repairs of basements due to ground water seepage.		3	1,2,3
3.3 REPAIR OF RCC Repair for RC Old and new Slabs, RC Beams and Columns damaged by Steel Corrosion. Repair of Cracks in Concrete Members. Repair of Sunshades (Chajja).	6	4	3,4
3.4 RETROFITTING Column Foundation Rehabilitation by Jack pile method. Strengthening RC Beams, Columns and Slabs by (i) Plate Bonding (ii) RC Jacketing and (iii) FRP Methods, RC Slab Strengthening by Concrete Overlay.	6	3	4
UNIT 4 TIMBER			
4.1 WOOD Deterioration of Wood - causes, Need for Wood Protection, Maintenance and restoration, Repair.	6	3	1
4.2 TERMITES IN BUILDINGS Termite Control, Treatment of Building invaded by termites, Pest Control Technique.	6	2	3
4.3 FUNGAL DECAY IN BUILDINGS Two types of Fungus and conditions for their growth. Recognition of dry and wet rot. Treatment of Fungal Attack.		2	3
UNIT 5: OTHER MAINTENANCE			
5.1 ELECTRICAL Causes of damage to electrical installations, Causes of short circuit, Devices for Alternate supply of Power during Power Failure and Repairs. Maintenance of Electric system in buildings. Tools and equipment needed for electrical repairs.	6	3	1,4
5.2 PLUMBIMG Plumbing Safety, Tools and Equipment for plumbing. Repair and Maintenance of Pipes, Fittings, Faucets and Sinks. Repair and Maintenance of Septic Tank and Soak Pit.	6	3	1,4
5.3 OTHER Repair and maintenance of metal fixtures. Damage by plants and vegetation (moss) from walls and Removal of plants and moss.		2	1,4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Introduction to maintenance, repair and retrofitting	10	18
2	Masonry	10	15
3	Concrete	13	18
4	Timber	7	12
5	Other Maintenance	8	12
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical Class Room Assignments Journal	Marks
1	a) Identification of defects in masonry and suggest repair methodology b) Identification of defects in waterproofing works and suggest repair mechanism c) Identification of defects in flooring and suggest remedial measures d) Identification of defects in painting and suggest remedies e) Identification of defects in plastering and offer rehabilitation technique f) Identification of defects in RCC members such as columns, beams, slabs and suggest repair techniques. g) Identification of defects in windows and suggest repairs. h) Identification of defects in doors and suggest repairs. i) Study of house electrical system and suggest planned maintenance j) Study of house plumbing system and suggest planned/repair maintenance Study house waste water disposal system and suggest planned maintenance	15
No	**Drawing / Sketch Book Exercise**	**Marks**
1	Drawings for above	10
...	**Total**	**25**

9. LEARNING RESOURCES Text Books

S. No.	Author	Title of Books	Publishers
1	P. C. VARGHESE	Maintenance, repair & Rehabilitation and minor works of buildings	PHI Learning Pvt. Ltd
2	Jan Bijen	Durability of engineering structures - Design, repair and maintenance	CRC Press, Wood head Publishing
3	A C Panchdhari	Maintenance Of Buildings	New age International (P) Ltd Publishers New Delhi
4	Gahlot; Sharma	Building Repair and Maintenance Management	CBS Publishers & Distributors
5	Kurt F. von Fay	Guide to Concrete Repair	USDIBRTSC

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	CPWD	Handbook of Repair and Maintenance of Buildings	
2	CPWD	Maintenance Manual	
3	Govt. of India, Ministry of Railways	Retrofitting of Existing Buildings	

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 621) GEOTECHNICAL ENGINEERING

1. COURSE OBJECTIVES:

The students will able to understand and explain soil mechanics and geotechnical engineering. The students will be able to determine properties of soil by following standard test and use soil mechanics for shallow and deep foundations. The knowledge of geotechnical engineering may also be used for landfills and geo-textiles designs.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VI**								
Course Code & Course Title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
CI 621 Geotechnical Engineering		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO621.1. Discuss, and Explain, fundamentals and origins of soil engineering

CO621.2. Apply, knowledge of soil mechanics and Sketch foundations, soil retaining structures and improvement

CO621.3. Analyze and differentiate the utility and methods of construction of soil structures,

CO621.4. Propose and Plan appropriate solutions to land fill problems and use geo-textiles

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO621.1	1	-	-	-	-	-	-
CO621.2	1	2	2	2	2	-	2
CO621.3	1	1	1	1	2	1	2
CO621.4	1	2	2	2	2	2	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO621.1	1	1
CO621.2	2	2
CO621.3	2	2
CO621.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: SOIL ENGINEERING					
1.1 GEOTECHNICAL ENGINEERING History of geotechnical engineering, Pre-classical period of soil mechanics, Modern soil mechanics, Origin of soils,			6	3	1
1.2 SOIL CLASSIFICATION SYSTEMS Textural, AASHTO, IS, Unified Classification systems , typical (densities, specific gravities, particle size distribution curves, Atterberg constants) for different soils and lateritic soils				3	1
1.3 SUB SOIL EXPLORATION List of laboratory soil tests, List of standard and dynamic in-situ soil tests, Split Spoon Sampler, SPT Test, CPT Test, vane shear test, borehole logs, rock coring, typical soil exploration report			6	3	1
1.4 INTRODUCTION TO GEOTECHNICAL EARTHQUAKE ENGINEERING Introduction to liquefaction, methods to control liquefaction, concept of Soil structure interaction, base isolation techniques			6	3	1
UNIT 2: FOUNDATIONS					
2.1 INTRODUCTION Types of foundations, forces acting on foundation, settlement and consolidation			6	4	2
2.2 SHALLOW FOUNDATIONS Bearing Capacity and tests for finding, permissible settlements			6	4	2
2.3 DEEP FOUNDATIONS Pile Capacity and tests for finding, permissible settlements			6	4	2
UNIT 3: SOIL RETAINING AND IMPROVEMENT					

3.1 RETAINING STRUCTURES Rankin's and Coulomb's earth pressure, types of retaining structures, types of slope stabilization methods, use of vegetation for slope stabilization.	9	3	2
3.2 MECHANICALLY STRENGHTENED RETAINING WALLS Need, types and techniques , sections and functions of components of MSWs		2	2,4
3.3 MODERN PRACTICES Soil Nailing, Rock Bolting, Soil Anchors, guniting, soilcrete, dynamic compaction, micropiling, root-piling, underpinning, stone columns, sand drains, pre-consolidation techniques	6	5	4
UNIT 4: SOIL STRUCTURES			
4.1 ADOBE STRUCTURES Structures made of soil, methods and techniques used for mud structures,	6	2	3
4.2 EMBANKMENTS Typical cross sections and stability of embankments.		3	2,3
4.3 EARTH AND ROCK FILL DAMS Typical cross sections and stability of earth and rock fill dams. Phreatic line, flow-nets, function and types of (pitching, cores, blankets, toes etc) Construction methods.	6	3	2,3
UNIT 5: LANDFILLS AND GEOTEXTILES			
5.1 LANDFILLS Definition types and typical sections of sanitary landfills, landfill liner systems, leachate and gas control, landfill disasters and their mitigation, landfill compaction	6	3	4
5.2 GEOTEXTILES Types, materials and manufacture of Geotextiles, Functions and uses of (GCL, Geomembranes, Geonets, Geomeshes, geo-drains,)	6	3	4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Soil Engineering	12	18
2	Foundations	12	18
3	Soil Retaining and Improvement	10	15
4	Soil Structures	8	12

5	Landfills and Geo-Textiles	6	12
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Field tests for 5 soils in Goa SPT Test, CPT Test, vane shear test, borehole logs, rock coring	10
2.	5 laboratory soil tests on soils collected above	
3.	standard and dynamic in-situ soil tests	
No	**Class Room Assignments**	**Marks**
1	At least 10 covering all units above	5
No	**Sketch Book Exercise**	**Marks**
1	At least 10 problems on unit given above	5
	Total	**25**

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Braja Das	Principals of geotechnical engineering	Cengage Learning, Stanford USA
2	Dr. B. C. Punmia	Soil Mechanics & Foundation Engineering	Standard Book house, New Delhi
3	Murthi	Soil Mechanics & Foundation Engineering	Tata McGraw Hill , New Delhi

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Gulhati &Dutta	Geo-technical Engineering	Tata McGraw Hill , New Delhi
2	B. J. Kasmalkar	Soil Mechanics	Pune VidhyartiGriha, Pune

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 624) CONSTRUCTION EQUIPMENTAND MACHINERY

1. COURSE OBJECTIVES:

The students will able to understand various advanced methods of construction and select suitable construction equipment's for execution of various constructions activities. The student will be able to decide on criteria for basic and advanced equipment used in construction

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VI**									
Course Code & Course Title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**				
						Theory Marks		**Practical Marks**		**Total Marks**
CI 624 Construction Equipment and Machinery		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO624.1. Identify and Estimate equipment management and safety requirements

CO624.2. Demonstrate Use of construction equipment's correctly, concisely and effectively

CO624.3.Analyze and Select suitable construction equipments to perform construction operations effectively,

CO624.4. Organize and Plan appropriate equipment for various construction needs and problems

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO624.1	2	2	2	2	2	2	2
CO624.2	1	-	-	1	2	3	3
CO624.3	2	2	2	2	1	3	3
CO624.4	2	3	3	1	1	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO624.1	3	3
CO624.2	3	3
CO624.3	3	3
CO624.4	3	3
Total	**12**	**12**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: EQUIPMENT MANAGEMENT AND SAFETY					
1.1 EQUIPMENT MANAGEMENT Standard equipment, Special equipment, Selection of equipment, Owning and operating cost of construction equipment. Economic life of construction equipment. Preventive maintenance of equipment, Break down maintenance of equipments.			6	3	1,4
1.2 SAFETY EQUIPMENT List of safety equipment needed at construction site and situation where each is used (personal and workplace), component and use			6	3	1,2
UNIT 2: EARTH MOVING, HOISTING AND CONVEYING					
2.1 EXCAVATING MACHINERY Construction and working of following equipment (basic shovels, Hoe, Drag-lines, clamshell, hydraulic shovels), comparison between cable operated and hydraulically operated equipment. Comparison between crawler and wheel mounted equipment.			6	3	2,3
2.2 EXCAVATION & LEVELLING MACHINERY Construction and working of crawler-mounted and wheel mounted (bull-dozers, scrapers, graders) Comparison between hydraulically and cable operated bull-dozers.				2	2,3
2.3 TRANSPORTING & CONVEYING MACHINERY Construction and working of belt conveyors, cable-way, excavators and scrapers. Types of belts and conveying mechanism. Capacity and use of Dumpers, tractors and trucks. List of equipment used to transport materials. Vertical and horizontal transportation. Types and uses of trucks and dumpers.			9	4	2,3

2.4 LIFTING& HOISTING EQUIPMENTS Construction and working of different types of lifts and winches. Principle and working of Tower cranes, Crawler cranes, Truck mounted cranes, gantry cranes, Mast cranes, Derricks.		3	2,3
UNIT 3: PUMPING, DEWATERING, DRILLING AND GROUTING			
3.1 PUMPS Classification of pumps, brief description and working of following pumps(reciprocating pumps, centrifugal pumps, diaphragm pumps, submerged pumps), principals and conditions for selection of pumps	6	3	2,3
3.2 DEWATERING List of different dewatering systems, Construction and working of well point system	6	2	2,3
3.3 DRILLING AND GROUTING Brief description and working of electrical drill. Equipment used for grouting; schematic layout of grouting equipment.		3	2,3
UNIT 4: TMIXING AND COMPACTING			
4.1 MIXING EQUIPMENT Construction and working of concrete mixers (tilting drum, nontilting drum, pan-mixers, agitators). Brief description of concrete batching plant for ready-mix concrete. Schematic layout of placing of ready-mix concrete on site	6	3	2,3
4.2 COMPACTION EQUIPMENT Necessity and methods of concrete compaction, Construction and working of following (internal and external vibrators, surface vibrators, vibrating tables). Necessity and methods of soil compaction. Construction and working of following (sheep foot rollers, vibratory rollers, smooth rollers).	6	3	2,3
UNIT 5 MISCELLANEOUS EQUIPMENTS			
5.1 PILING EQUIPMENT Methods for driving/placing following piles- sheet, steel, timber, pre-cast concrete, cast-in-situ concrete,) Advantages and disadvantages of cast-in-situ concrete piles. Construction and working of pile hammers. Pile driving equipment, Pile hammers, and selection of hammers.	6	4	2,3
5.2 COMPRESSED AIR Pneumatic Compressors- Construction and working of different types of air compressors (reciprocating, rotary, screw and centrifugal), Pneumatic Tools- Construction and working of different types of pneumatic tools (hand held drills, pavement breakers, rotary blast hole drill, jack hammer, wagon drill).	6	4	2,3
5.3 STONE CRUSHING Classification of stone crushers (primary, secondary, tertiary). Construction and working of following (jaw crushers, gyrator, hammer-mill cone). Construction and working of screens for crushing stone. Types of stone crushers, capacities and working. Equipments for production of artificial sand.	6	4	2,3

5.4 MISCELLANEOUS EQUIPMENTS Working of hot mix bitumen plant, Bitumen paver. Grouting equipments, Floor polishing machine. List of equipment used for open-well and box caissons. List of equipment used for tunnelling List of equipment used for Underground Cabling.	6	4	3,4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

UnitNo	Unit	Number of Lectures	Marks
1	Equipment management and safety	6	12
2	Earth moving, hoisting and conveying	12	15
3	Pumping, dewatering, drilling and grouting	8	12
4	Mixing and compacting	6	12
5	Miscellaneous equipment's	16	24
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical	Marks
1.	Models of any 2 equipment (of cardboard /mount board/ thermacole -with moving parts)	6
2	layout of ready-mix concrete plant on drawing sheet	2
3	layout hot mix plant on drawing sheet	2
No	**Class Room Assignments**	**Marks**
1	At least 10 covering all units above	5
No	**Sketch Book Exercise**	**Marks**
1	On all equipment	10
	Total	25

9. LEARNING RESOURCES:

Text Books

S. No.	Author	Title of Books	Publishers
1	R. Chudly	Construction Technology Vol. I to IV	ELBS- Longman Group
2	S. Seetharaman	Construction Engineering and management	Umesh Publication, NewDelhi
3	Sengupta and Guha	Construction management and Planning	Tata McGraw Hill
4	. M. L. Gambhir	Concrete Technology (Third Edition)	Tata McGraw Hill
5	S. C. Rangawala	Construction of structures and Management of Works	Charotar Publication
6	D.N. Ghose	Construction Materials	Tata McGraw-Hill
7	R. Satyanarayana and S. C. Saxena	Construction Planning and Equipment	Standard Publication NewDelhi

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Mahesh Verma	Construction Equipment	Metropolitan Book Co
2	R,L Peurifoy	Construction Planning Equipment and Methods	McGraw-Hill Co. Ltd.
3	Khanna	Practical Civil Engineering Handbook	Khanna Publication
4	PWD	PWD Handbooks for -Materials- Foundation- Construction equipments	Govt. of Maharashtra
5	Mantri Construction	A to Z of Building Construction	Mantri Publication
6	TTTI Chandigarh	Civil Engineering materials	TTTI Chandigarh
7	TTTI Madras	Building Technology and valuation	TTTI Madras
8	R. C. Smith	Materials of construction	McGraw-Hill Co. Ltd.

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CN603) AUTOMATION SYSTEMS IN CIVIL ENGINEERING

1. COURSE OBJECTIVES:

The students will able to. Acquire knowledge of Automation methods. Develop the ability to automate civil engineering works with precision. Acquire sufficient skills to tackle mechatronics problems related to Civil Engineering.

2. TEACHING AND EXAMINATION SCHEME

Semester	**VI**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CN603		**L**	**T**	**P**	**C**	**TH**	**TM**	**TW**	**PR/OR**	
Automation Systems in Civil Engineering		**3**	**0**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO603.1. Understand and, Discuss, utility of Mechatronics with a construction perspective

CO603.2. Employ and, Operate Home Automation operations effectively

CO603.3. Distinguish, and Analyze, impact of automation in transportation, water-supply and sanitary industry,

CO603.4. Propose, and Plan Recognize appropriate civil engineering applications of Mechatronics

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability& Environment	Project Management	Life -long Learning
CO603.1.	2	-	-	1	1	1	3
CO603.2.	1	1	1	1	1	2	2
CO603.3.	2	-	-	2	2	2	2
CO603.4.	1	1	1	2	2	1	1

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO603.1.	2	1
CO603.2.	2	2
CO603.3.	1	2
CO603.4.	2	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**TH = Teaching hours**	**CO = Course Objectives**			
UNIT			**M**	**TH**	**CO**
1 INTRODUCTION TO MECHATRONICS					
1.1 INTRODUCTION Definition of Mechatronics, history of Mechatronics, multidisciplinary nature of Mechatronics, applications of Mechatronics in civil engineering, advantages and disadvantages of automation, different levels of Mechatronics.			6	4	1
1.2 PRODUCT REALIZATION Definition of Product realization, Sequential v/s concurrent Product Realization, Flowchart of Mechatronics design process.			6	3	1
1.3 ELEMENTS OF MECHATRONICS Flow chart of Key elements of Mechatronics, List of different senses and actuators, classification of control system (open & closed loops),real time interface, Software used in Mechatronics.			6	4	1
2 HOME AUTOMATION					
2.1 HOME AUTOMATION SYSTEM Definition of Domotics or smart homes, necessity of Domotics, difficulties in home automation, List of different home automation application.			6	4	2
2.2 SOFTWARE BASED AUTOMATION Use of Arduino in home automation, Block diagram of Home automation using Arduino, components of home automation using Arduino & Bluetooth, Hardware and Software parts of Arduino			6	4	2
3 AUTOMATION IN TRANSPORTATION					
3.1 AUTOMATED TRANSPORT SYSTEMS (ATS) Definition of Automated Transport System / Intelligent Transport system (ITS), application of Intelligent Transport System, benefits of Intelligent Transport System.			6	4	3
3.2 ROAD AUTOMATION Need for automation in roads/ highways, Automated Highway System (AHS), Subsystem of Automated Highway System (Key application), List of ITS applicable to roads, Traffic management using automation, Vehicle automation , Benefits of Automated Highway System.			6	4	3
3.3 RAILWAY AUTOMATION Automatic train control systems, Operation control in railways, Level crossing protection, List of ITS applicable to rails.			6	3	3
4 AUTOMATION IN WATERSUPPLY, SANITARY AND IRRIGATION ENGINEERING					
4.1 PUMPING STATIONS Optimization approach for pumping station, Use of Artificial Intelligence in demand forecasting, Pressure dependant control, Level dependent control, Temperature dependent control.			6	3	3

4.2 WATER AND WASTE WATER TREATMENT Role of automation in water and waste water treatment, Process control and parameter for water treatment, Process control and parameter for waste water treatment, Need for automation in water and waste water treatment, advantages and limitation of automation in water and waste water treatment, Use of PLC(Programmable logic Controller)	6	3	3
4.3 IRRIGATION Sensors used, Effect of automation on plant growth, Effect of automation on water use efficiency, Components of automated irrigation system, Flow chart of automated irrigation system for drip & sprinkler.		3	3
5 OTHER CIVIL APPLICATIONS OF MECHATRONICS			
5.1 AUTOMATED PRODUCTION PROCESSES Flow Chart of automated cement manufacturing, Flow chart of automated Brick manufacturing, Flow chart of automated pre-fabricated parts manufacturing	3	2	1,4
5.2 AUTOMATED INFRASTRUCTURE Flow chart of automated garbage treatment plant, Necessity of automation in land surveying, Application of automation in Tunnelling, Automated building construction process, Short Note on Automated Land measuring system.	6	3	4
5.3 ROBOTICS IN CIVIL ENGINEERING Shorts Note on demolition robots, 3D printed building technology, Use of Drones in Civil Engineering, Short Notes on Brick laying robots, Use of Welding robots in buildings.	6	4	1,4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to mechatronics	11	18
2	Home automation	8	12
3	Automation in transportation	11	18
4	Automation in water-supply and sanitary engineering	9	12
5	Other civil applications of mechatronics	9	15
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS Intellectual

Skills:

1. Classifyautomation for civil engineering.
2. Propose methods for automation in civil engineering works.
3. Designmechatronics project for civil engineering.
4. Compare used in mechatronics

Motor Skills:

1. Survey for automation
2. Invent a mechatronics project for civil engineering
3. Draw layouts and flowcharts

No	Practical /Assignments	Marks
1.	At least 10 covering all units above	
	A Mechatronics mini automation project	
	Total	25

9. LEARNING RESOURCES Text Books

S. No.	Author	Title of Books	Publishers
1	Oonk&Svensson	Roadmap Automation in Road Transport	iMobility Forum 2013
2	HollySys	Water treatment Industry Solutions	HollySyssingapore
3	Kaur S, Rashmi Singh R, Khairwal N & Jain P	Home Automation And Security System	(ACII), Vol.3, No.3, July 2016
4	Kyas O	How to Smart Home	Key Concepts Press
5	Francesco Filippi	Automated Transport Systems	Centre for Transport and Logistics, Sapienza University
6	Dubey, Agarwal, Gupta, Dohare and Upadhyaya	Automation and control of water treatment plant for defluoridation	International Journal of Advanced Technology and Engineering Exploration,
7	Joshi & Shah	Automation in construction industry	IJARESM Vol 2/3
8	Moreles et al	Robots and Construction automation	University of Florida
9	A Ruggiero	Robotics in Construction	Worcester Polytechnic

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1		Intro to mechatronics	pdf
2	Robert H. Bishop	The Mechatronics Handbook	CRC Press
3	Haimi H, Mulas M, Vahala R	Process automation in Wastewater Treatment Plants: the Finnish experience	European Water Association

4	W P Luedke,	Water Treatment Process Automation and Control	415AD50a Bristol
5	Kim, Chi, Wang and Ding	Automation and Robotics in Construction and Civil Engineering	J Intell Robot Syst (2015) 79:347–350

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(AC 101) ESSENCE OF INDIAN KNOWLEDGE & TRADITION

1. COURSE OBJECTIVES:

This course aims at imparting basic principles of thought process, reasoning and inferencing by human being. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic life style of Yogis, science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. The course thus focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view, basic principles of Yoga and holistic health care system.

2. TEACHING AND EXAMINATION SCHEME:

Semester	VI									
Course Code & Course Title	Periods/Week (in hours)			Total Hours	Examination Scheme					
					Theory Marks		Practical Marks		Total Marks	
(AC 101) Essence of Indian Knowledge & Tradition	L	T	P	C	TH	TM	TW	PR/OR		
	2	0	0	2	0	0	0	0	Gr.	

3.

Course Content:

Basic Structure of Indian Knowledge System:

(i) वेद, (ii) उन्नवेद (आयुवेद, धनुवेद, गन्धवेद, स्थान्नत्य आदद) (iii) वेदांग (शिक्षा, कल्न, ननरुत, व्याकरण, ज्योनतष छांद), (iv) उन्नाइग (धर्म ग्सि, रीरांसा, नुराण, तकमिास्र)

- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

SUGGESTED TEXT/REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1.	Cultural Heritage of India-Course Material	V. Sivaramakrishna	Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2.	Modern Physics and Vedant	Swami Jitatmanand	Bharatiya Vidya Bhavan
3.	The wave of Life	Fritzof Capra	
4.	Tao of Physics	Fritzof Capra	
5.	Tarkasangraha of Annam Bhatta, Inernational	V N Jha	Chinmay Foundation, Velliarnad, Amaku,am
6.	Science of Consciousness Psychotherapy and Yoga Practices	RN Jha	Vidyanidhi Prakasham, Delhi, 2016

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DIPLOMA IN CIVIL (CONSTRUCTION) ENGINEERING

SEMESTER-VII

Course Code	Name Of Course	Teaching Scheme				Examination Scheme				Total Marks
		L	T	P	H	Theory		Practical		
						TH	TM	PR/OR	TW	
CI 601	Public Health Engineering	3	0	2	5	75	25	-	25	125
CI 501	Design of Concrete Structures	3	0	2	5	75	25	25	25	150
CI 604	Civil Engineering Project	0	0	6	6	0	0	50	50	100
CN 701	Project Management	3	0	2	5	75	25	0	50	150
E-II	Elective-II	3	0	2	5	75	25	25	25	150
AC 102	Indian Constitution	2	0	0	2	-	-	-	-	Gr.
	Total	**14**	**0**	**14**	**28**	**300**	**100**	**100**	**175**	**675**
Total Contact Hours 30 hours										
L-Lecturers, T- Tutorials, P-Practical, C-Hours, TH-Theory Marks ,TM- Test Marks, PR-Practical Marks, TW-Term Work Marks										
Duration of Theory Paper 3 hours										

Minimum Batch Size 10 Students for Grant of Elective

Elective II	
CI 612	Solid Waste Management
CI 613	Transportation Engineering-II
CI 614	Construction Advanced
CI 622	House Plumbing and Sanitation
CI 625	Sustainable Design of Buildings
CI 626	Enterprise in Civil Engineering

(CI 601) PUBLIC HEALTH ENGINEERING

1. COURSE OBJECTIVES:

The syllabus is divided into four parts viz- water supply, sanitary engineering, house plumbing and drainage and solid waste management. It is aimed at giving students an overview of water and waste water treatment processes and developing an understanding of conveyance and plumbing systems. Curriculum is designed to give students exposure on house plumbing and drainage systems and the overview of latest technologies in solid waste management and to study management of water and waste materials with its problems and their effects on environment

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VII**								
Course Code & Course Title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CI 601 Public Health Engineering		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**0**	**125**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO601.1. Identify and Estimate water demands and sewerage production

CO601.2. Interpret, water and waste water problems and Apply appropriate solutions to them

CO601.3. Test, inspect and analyze quality of water and impact of sewage

CO601.4. Plan Design and Manage water and sewage treatment systems

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO601.1	2	2	2	2	2	3	3
CO601.2	2	3	3	3	3	2	2
CO601.3	2	2	2	2	3	2	2
CO601.4	1	3	3	1	1	2	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO601.1	2	2
CO601.2	3	3
CO601.3	2	2
CO601.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: PUBLIC WATER SUPPLY					
1.1 QUANTITY OF WATER Demands of water (Domestic, Industrial, Commercial & Institutional, Public use, Losses and wastes, Fire demand) ; Factors affecting rate of Demand, Estimation of quantity of water supply required for a town or city, Variation of demand(Monthly, daily and hourly). Losses and wastage			6	2	1
1.2 SOURCES OF WATER Surface and Subsurface sources of water, Water conservation, Factors controlling the selection of sources Ground water recharge, types of intake structures, the location of an intake structure,			6	2	1
1.3 CONVEYANCE AND DISTRIBUTION OF WATER Types of water supply schemes. (Continuous and Intermittent supply system) Layouts of distribution of water (Dead end system, grid iron system, circular system, radial system) Methods of distribution of water (Gravity, pumping, and combined system) types of Service reservoirs (Ground and elevated), fire hydrants: locations, necessity, types.			6	2	1,4
UNIT 2: WATER TREATMENT					
2.1 QUALITY OF WATER Need for analysis of water, List of Characteristics of water-(Physical, Chemical and Biological) Sampling of water, Water quality standards as per I. S. 2296 : 1982., Water borne diseases and their list			9	6	1,3

2.2 PURIFICATION OF WATER (No designs and problems, only overview of treatment description and diagrams expected). Flow diagram of water treatment plants, Screening, Aeration, Plain sedimentation, Sedimentation with coagulation, Clariflocculator types of coagulants, slow sand filter, rapid sand filter, pressure filter, Different methods of disinfection, disinfection by Chlorination, residual chlorine and its importance, Water softening, Electrolysis, Reverse Osmosis	9	9	2
UNIT 3: BUILDING SANITATION			
3.1 INTRODUCTION Importance and necessity of sanitation, Necessity to treat domestic sewage, Recycling and Reuse of domestic waste.	6	3	1
3.2 BUILDING SANITATION Definitions (Water pipe, Rain water pipe, Soil pipe , Sullage pipe, Vent pipe, Building sketch of Sanitary fittings(Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals, Traps, building sanitary fittings)		3	2
3.3RURAL SANITATION Types, construction and working of Low cost Latrines (Aqua privy and Bore Hole Latrine) Composting and Effective Microorganisms(EM)	6	1	4
3.4PLUMBING Types of Pipes used for Water and Sanitation, Types of joints, Fittings- and appurtenances used in Water and Sanitation, Layout, of water supply and sewage arrangement for residential and public building, Rainwater and sewage collection systems, Systems of plumbing –(one pipe, two pipe, single stack, choice of system)		2	3,4
UNIT 4: SEWAGE			
4.1 CHARACTERISTICS OF SEWAGE Types of sewage (domestic and industrial), Definitions of (Sewage, sullage, refuse & garbage)Domestic and Industrial Waste Water Characteristics B.O.D., C.O.D., Aerobic and anaerobic process, Norms for the discharge of treated sewage, Water pollution	6	6	3
4.2 COLLECTION OF SEWAGE Sewers, manholes, Chambers, Sewage collection systems, Pipe materials and shapes used for sewers, factors affecting sizes of sewers Laying of sewers, Location and function of Man holes	6	3	4
UNIT 5: SEWAGE TREATMENT AND POLLUTION CONTROL			

5.1 TREATMENT OF SEWAGE Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process, Disposal of sewage, Septic tank, Oxidation pond, Oxidation ditch, Aerobic and anaerobic decomposition, Conservative system and Water carriage system, Comparison, / advantages and disadvantages	9	3	2
5.2 INDU STRIAL WASTE Types and of Industrial waste water (sugar, Dairy, Distillery, Textile, Paper and Pulp and Oil industry) and their suggestive treatments	6	3	2
5.3 POLLUTION CONTROL Methods of collection and methods of disposal of dry waste from the society, Pollution and Control: Air pollution, noise pollution, food pollution, controlling pollution by Public Health Engineer and the Public authorities, Advising and education the public to maintain a hygienic and healthy environment		3	4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Public Water Supply	6	18
2	Water Treatment	15	18
3	Building Sanitation	9	12
4	Sewage	9	12
5	Sewage Treatment	9	15
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	**Practical** (The lab work or writing in detail any 5 procedure in the journal with sketches)	Marks
1	Test on turbidity by Turbidity rod, Jackson turbid meter, Baylis turbid meter, Digital turbid-meter	2
2	Test on Colour, Taste and Odour.	2
3	Test on Total solids, Suspended solids and Dissolved solids	2
4	Test on pH value of water, use of indicators.	2
5	Testing Hardness	2
6	Test on Dissolved Oxygen, B.O.D	2
7	Test on Residual Chlorine chloride contents	2
8	Test on Nitrogen content	2

No	**Five half imperial or A3 size drawing sheets on**	Marks
1	Flow diagram of a Typical Water Treatment Plant.	2
2	Sketches of screen, Clariflocculator	2
3	Section of a Rapid sand gravity filter, Plan of under drainage system	2
4	Flow diagram of a typical Sewage Treatment Plant	2
5	Trickling filter	2
6	Sludge Digestion Tank, Sludge drying beds	2
7	Plan and section of a septic-tank, soak pit, Table for the design dimensions	2
8	water supply plumbing systems for a two storied building	2
9	Sanitary plumbing systems for a two storied building	2

No	**Visit to water treatment and sewage treatment plant.**	Marks
1	Report on above	5
	Total	**25**

9. LEARNING RESOURCES Text

Books

S. No.	Author	Title of Books	Publishers
1	Santosh Garg	Environmental Engineering (Volume I & II)	Khanna Publishers,
2	Deolalikar S. G	Plumbing – Design and Practice	DhanpatRai& Sons
3	Kamla A. &Kanth Rao D. L.	Environmental Engineering	Tata McGraw Hill,
4	Santosh Kumar Garg	Water Supply Engineering	Khanna Publishers , New Delhi
5	Santosh Kumar Garg	Sewage Treatment /Sanitary Engineering	Khanna Publishers , New Delhi
6	Kamala &Rao	Environmental Engineering	Vikas Publishing House Pvt. Ltd., Noida (UP)

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Rao &Dutta	Industrial Water Treatment	Oxford & IBH Publishing Co Pvt.Ltd
2	H. M. Raghunath	Ground Water	New Age International
3	Birdie G. S. Birdie J. S.	Water Supply and Sanitary Engineering	Tata McGraw Hill

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 501) DESIGN OF CONCRETE STRUCTURES

1. COURSE OBJECTIVES:

To keep the pace confidently in construction industry, a civil engineer should be acquainted with new method of design, such as limit state method of design. Reading and interpretation of structural drawings is basic skill required to be developed in students. The students will be able to acquire the knowledge of fundamentals, principles of reinforced concrete and relevant Indian standard codes for design and detailing of R.C.C. structures.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VII**								
Course Code & Course Title		**Periods/Week (In hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CI 501 Design of Concrete Structures		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO501.1. Comprehend, discuss and utilize the basic principles of design of RCC

CO501.2. Interpret design to Estimate the section and reinforcement using LSM

CO501.3.Analyse the RCC sections correctly

CO501.4. Compose, assess and represent the proper reinforcement detailing

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society,Sustainability& Environment	Project Management	Life -long Learning
CO501.1	1	-	-	2	-	2	2
CO501.2	2	2	3	2	1	1	1
CO501.3	3	3	3	3	1	1	2
CO501.4	1	1	1	1	-	-	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO501.1	2	3
CO501.2	2	3
CO501.3	3	3
CO501.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: FUNDAMENTALS OF RCC DESIGN					
1.1 INTRODUCTION TO RCC DESIGN Concepts of RCC structures. Advantages and disadvantages of RCC structures, Grades of concrete and steel. Loads and load combinations. Comparison of working stress method, ultimate load method and limit state method of RCC design			6	**3**	1,
1.2 INTRODUCTION TO LIMIT STATE METHOD Characteristic values and design values for material and loads. Partial safety factors for materials and loads, Definition and objectives-of different Limit states (collapse, flexure, compression and shear, serviceability, deflection etc).			6	**3**	1
UNIT 2: SINGLY REINFORCED SECTIONS					
2.1 SINGLY REINFORCED SECTION Assumptions in Limit State of collapse in flexure, stress-strain relationship for concrete and steel (proof stress). Neutral axis, stress-block diagrams and strain diagram. Expressions for depth of neutral axis, limit value of neutral axis, Percentage of steel, minimum and maximum percentage, lever arm and limiting moment of resistance, Concept of under-reinforced over-reinforced and balanced-sections (Simple numerical problem on determining design constants, moment of resistance and area of steel only, no derivations and problems on over reinforced sections for exam)			6	**5**	2,3
2.2 DESIGN OF SINGLY REINFORCED SECTION Design procedure for given span and load on RC flexural member & reinforcement detailing (Simple numerical problem on design of simply supported singly reinforced section only)			6	**6**	3,4
UNIT 3: SHEAR AND BOND					

3.1 SHEAR AND BOND Nominal shear stress, shear strength of concrete, maximum shear stress, Shear strength of reinforced concrete beam. : Concept of bond and development length, anchorage value for 90^0 bend & 45^0 bend. Standard lapping length for reinforcing bars.	6	**4**	2,3
3.2 SHEAR REINFORCEMENT Types of shear reinforcement, provision of shear reinforcement by truss analogy. Minimum shear reinforcement, design procedure of shear reinforcement by vertical stirrups and bent up bars. (Simple numerical problem on design of vertical stirrups and check for development length only)	6	**4**	3,4
UNIT 4: SLABS & STAIRCASE			
4.1 SLABS Classification based on support conditions and load transformation to supports. Design procedure for one way simply supported and continuous slab, cantilever slab (balcony, chajja) and two way slab (with various end conditions as per IS 456-2000 tables) (Simple numerical problems on design of: Cantilever slab, One way simply supported slab, One way four span continuous slab (spans equal), Two way slab (only corners held down)	12	**8**	3,4
4.2 STAIRS Design procedure for dog legged stair slab (simple numerical problems single flight of Dog legged stair slab for given geometrical details)	6	**4**	3,4
UNIT 5: OTHER RCC SECTIONS			
5.1 DOUBLY REINFORCED SECTIONS Necessity, situations under which used (no numerical problems)	3	**1**	3,4
5.2 FLANGED BEAMS Necessary- conditions, effective width of flange as per IS :456-2000 code provisions, advantages (no numerical problems)	3	**2**	3,4
5.3 COLUMNS Classifications –short &long column. Assumptions in limit state of collapse – compression, Specification for minimum reinforcement; cover, maximum reinforcement, minimum number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties. Design procedure for short axially loaded column sections with lateral ties, reinforcement detailing Check for minimum eccentricity (Simple numerical problems on design of axially loaded rectangular short columns only)	6	**4**	3,4
5.4 COLUMN FOOTING Design procedure of square footing for axially loaded square short column. (Simple numerical problems on design of isolated concentric square footings under square column with checks also for one way and two way shear)	9	**4**	3,4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Fundamentals of RCC design	6	12
2	Singly Reinforced Sections	11	12
3	Shear and Bond	8	12
4	Slabs and Stairs	12	18
5	Other R.C.C Sections	11	21
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical	Marks
1	The term work comprise sketch book/file consists of design and detailing of following items a.) RCC Lintel over door/ window opening b.) RCC Simply supported singly reinforced beam c.) RCC Cantilever beam d.) Simply supported One-way slab e.) RCC Continuous one-way slab (not more than four span) f.) RCC Two-way slab (with corners held down) g.) RCC Dog legged stair slab h.) RCC short Square & rectangular columns i.) RCC Square concrete footing for axially loaded column.	10
2	Design of 2 room single storey structure with two slab panels and six columns. Prepare working drawing with RCC Detailing and bar bending schedule	15
No	**Drawing/ Sketch Book Exercise**	**Marks**
	Total	**25**

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	S. N. Sinha	Reinforced concrete design	Tata McGraw Hill Publishing Co. Ltd, New Delhi
2	Ashok K. Jain	Reinforcement concrete Limit State Design	New' Chand and Bros Roorkee
3	Bhavikatti S S	Design of Reinforced structural elements Vol 1	New age International (P) Ltd Publishers New Delhi
4	S. R. Karve and V. L. Shah	Limit State theory and design of reinforced concrete structures	Structures publication and distributors, Pune
5	C. Syal and R. K. Ummat	Behaviour analysis and design of reinforced concrete structural elements	Wheeler publishing Co, Ltd, Allahabad
6	P. Purshothaman	Reinforced concrete structural elements	Tata McGraw Hill Publishing Co, Ltd, New

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	S.U. Pillai&DevdasMenon	Reinforced concrete Design	Tata McGraw Hill
2	P. C. Varghase	Limit State Design of Reinforced Concrete	Prentice Hall of India
3	N. Krishna Raju, R. N. Pranesh	Reinforced concrete Design	New Age International
4	N. C. Sinha& S. K. Roy	Fundamentals of Reinforced Concrete	S. Chand & Company,,

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1	IS 456:2000	Plain and Reinforced concrete code of Practice	Bureau of Indian Standard
2	SP16-1978	Design Aids for reinforced concrete to IS 456.	Bureau of Indian Standard
3	I.S. 875 (Part 1-5) - 1987	Code of practice of design loads for Buildings and structures. Part 1 - Dead load Part 2 - Imposed (live) load Part 3 - Wind load	Bureau of Indian Standard

4	SP 24	Explanatory Handbook on IS 456	Bureau of Indian Standard
5	SP34: 1987	Handbook on concrete reinforcement and Detailing	Bureau of Indian Standard New Delhi,
6	IS 13920-1993	Ductile detailing of R. C. Building subjected to Seismic forces.	Bureau of Indian Standard

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 604) CIVIL ENGINEERING PROJECT

1. COURSE OBJECTIVES:

In order to develop self-confidence and attain professional competence, the students, based on the knowledge gained already in different courses will be required to integrate, in order to take up and solve the real live problems in Civil Engineering. They are required to acquire skills in site investigation, collection of data, simple designing, drawing and estimating and prepare a comprehensive project report, leading to the execution of the scheme beneficial to socio- economic development of the community, The students in small groups (5 to 8 per group) will select any one of the projects in consultation with the faculty member concerned. Data collected will be required to integrate and prepare a comprehensive project report.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VII**								
Course Code & Course Title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
CI 604 Civil Engineering Project		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		0	**0**	**6**	**6**	**0**	**0**	**50**	**50**	**100**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO604.1. Identify and collect data for project and Plan for different phases of a task

CO604.2. Recognize, Read and interpret the drawings / data

CO604.3. Analyze, estimate and design the project components

CO604.4. Apply the civil engineering principles to accomplish the project and Organize Work in a group

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO604.1	2	2	2	2	3	3	3
CO604.2	2	1	1	1	1	2	2
CO604.3	2	2	2	2	2	2	3
CO604.4	1	1	1	3	2	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO604.1	3	3
CO604.2	3	3
CO604.3	3	3
CO604.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	Thr = Teaching hours	CO = Course Objectives			
			M	**Thr**	**CO**
UNIT 1: PROJECT ACTIVITIES					
1.1 TOPICS Following is the list /areas of suggested civil engineering projects to be undertaken by a group of 4 to 6 students. The project can be selected from any four civil engineering system. Topics for project can also be selected on recent development in civil engineering. SUGGESTED LIST OF CIVIL ENGINEERNG PROJECTS: • Bund & sluice gate, Bundara, Barrage, Weir and other irrigation structures • Minor dams and reservoirs • Lift Irrigation scheme. • Micro irrigation –Drip/Sprinkler Irrigation. • Junction planning for city roads/planning for roads for congested area • Parking Studies. • Water shed development of small catchments. • Rain water harvesting for domestic or public building. • Campus development. • Interior decoration. • Maintenance, repair or retrofit • NDT of any RCC building. • Solid waste management. • Hazardous/Hospital/Toxic/Radioactive waste disposal. • Recycling of resources. • Manufacturing of Pre-cast concrete products. • Mix Design for special concrete • Non-conventional sources of energy. • Concrete pipe manufacturing unit. • Advance construction techniques.			7	05	all

• Transfer of technology to villages. • Soil classification and modification Studies • Planning and design of Embankments and hill stabilization works • Design of special Concretes • Case studies of PWD works • Case studies of Disasters with causes or remedial measures • Case studies with Analysis using Civil engineering Software • Sustainable practices in civil engineering • Planning of Biodiversity parks • Planning of Amusement parks • Instruments/ machinery/ software development that has use in Civil or construction engineering • Any other topic as expressed in the syllabus with scope for further development.			
1.2 ACTIVITIES The PROJECT shall include the following activities based on the data collected: 1. Design the required elements of the project as-per standard practices. 2. Prepare the working drawings for the project. 3. Design and Detailing with a new material or technique, 4. Estimation of quantities and cost should essentially be included in all the projects. 5. Estimate the cost of the project, based on men, material and equipment required. 6. Prepare a Man-material schedule for project	25	70	
UNIT 2: PROJECT REPORT			
2.1 REPORT The project report shall be in the following format: 1. Synopsis (brief abstract 700 words of project) 2. Introduction (Topic and objectives) 3. Literature review (from minimum - 5 papers, 3 text books and some web sites) 4. Collection of data, required survey work, 5. Methodology / procedure (Management / construction/Operation/ Experimentation) 6. Analysis (Assimilation /Resources scheduling / Design) 7. Results (Required drawing sets if any) 8. Conclusion (Utility to society if any/conclusions/limitations of study/future scope) 9. Bibliography and references	15	16	all

2.2 OTHER PAGES IN REPORT Front page with institute logo Certificate Declaration Acknowledgement Contents 1. List of topics 1.1. and sub topics 2. List of figures and photo graphs 3. List of tables 4. List of drawings/plans References	3	5	all
Project report shall be submitted to institute in (black-Rexene hard-bound) hard copy and soft copy on CD. In addition, each student shall have a copy for him/her self.			
Project orals shall include (min 15-minute, 15 slide) Power point presentation (to be included in CD) - with working model/prototypes if necessary.			
Total	**50**	**96**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Activities	75	32
2	Report	21	18
	Total	**96**	**50**

(CN 701) PROJECT MANAGEMENT

1. COURSE OBJECTIVES:

The students will able to: Familiarize environment in the world of work and identify various components of management. Explain the importance of management process in Construction Business. Describe Role & Responsibilities of a Technician in an Organizational Structure. Apply various rules and regulations concerned with Business & Social Responsibilities of the Technician

2. TEACHING AND EXAMINATION SCHEME

Semester	**VII**								
Course code & course title		**Periods/Week (in hours)**			**Total Credits**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CN 701		**L**	**T**	**P**	**C**	**TH**	**TM**	**TW**	**PR/OR**	
Project Management		**3**	**0**	**2**	**5**	**75**	**25**	**50**	**0**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:
CO701.1. Recognize, the diverse components of management
CO701.2. Demonstrate and Practice the Role & Responsibilities of a Technician in an Organizational Structure effectively
CO701.3. Analyse, management process in Construction Business,
CO701.4. Recognize and propose appropriate solutions to management problems

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO701.1	2	1	1	1	2	2	3
CO701.2	1	-	-	-	-	3	3
CO701.3	2	-	-	1	2	3	3
CO701.4	2	3	3	2	2	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO701.1	3	3
CO701.2	3	3
CO701.3	3	3
CO701.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**TH = Teaching hours**	**CO = Course Objectives**			
UNIT			**M**	**TH**	**CO**
1 CONSTRUCTION BUSINESS (only concepts)					
1.1 OVERVIEW OF BUSINESS Types of Business (Service, Manufacturing, Trade, Agricultural) Introduction to Industrial sectors (Engineering, Process, Textile, Chemical, Agro-Construction) Introduction to Globalization, Advantages & disadvantages w.r.t. Construction industry			9	2	1
1.2 MANAGEMENT PROCESS Definition of Management, Levels of management, Administration & management, Scientific management by F.W.Taylor, Principles of Management of Henry Fayol. Functions of Management (Planning, Organizing, Directing, Controlling)				3	1
1.3 CONSTRUCTION BUSINESS Construction as a business, Agencies associated with construction industries, their functions and their interrelationship. Definition-necessity and importance of planning. Levels and stages of planning (pre-tender and post tender). Study of drawing, design, construction materials, equipment and human resources required for planning & execution.			6	3	1,2
2 MANAGEMENT OF HUMAN RESOURCES (only concepts)					
2.1 ORGANIZATIONAL MANAGEMENT Definition of Organization, Steps in organization, Types of organization (Line, Line & staff, Functional, Project) Departmentalization, Centralized & Decentralized, Authority & Responsibility, Span of Control, Forms of ownership (Proprietorship, Partnership, Joint stock, Co-operative Society, Public. Sector, Limited liability company)			6	5	2
2.2 HUMAN RESOURCE MANAGEMENT Definition and Functions of Personnel Management, Staffing, Recruitment Procedure, Training & Development, Skill Enhancement, Maslow's Theory of Motivation, Typical site organizational chart. Role of project engineer, Site Engineer and Site Supervisor			6	5	2
3 CAPITAL MANAGEMENT (only concepts)					
3.1 FINANCIAL MANAGEMENT Types of Capitals, Sources of raising Capital, Budgets and accounts, Balance Sheet Service Tax, Income Tax, GST, Custom Duty.			6	5	3,4
3.2 MATERIALS MANAGEMENT Meaning & Objectives of Inventory Management, Economic Order Quantity, Objects, Functions and Steps in Purchasing, Techniques of Material Management. Concept of Inventory control, Store keeping at site. Inspection and quality control of materials at site Storage and protection of cement, steel, and wood.			6	5	3,4

4 CONSTRUCTION PROJECT MANAGEMENT			
4.1 CONSTRUCTION PROJECT MANAGEMENT Meaning of Project Management, Concept of (Break Even Analysis, Quality Management, Quality Assurance, TQM), Scheduling and monitoring of construction projects. Methods of scheduling- Bar chart - CPM and PERT and their fields of application. (Simple problems with less than 8 activities).	9	5	3,4
4.2 CONSTRUCTION ACTIVITY Site layout. List of Records and books maintained at site (for materials, labour, works carried out etc.). Temporary arrangement housing for labour and storing materials at site. List of Different items of construction activities (earth-work in excavation, earth-work in back filling, PCC, concreting at below-ground-level, concreting at ground-level, concreting at above-ground-level, wood work for doors and windows, form-work, brick masonry, stone masonry, steel work, plastering, flooring, tiling, painting, waterproofing, sanitary and water supply services).	9	5	3,4
5 SOCIO ECONOMIC ASPECTS (only concepts)			
5.1 INTRODUCTION People's awareness, participation and response in construction activities Sustainable Construction, Green building, Energy conservation at site, pollution control at Site. Prevention of diseases at site.	6	2	3,4
5.2 CONSTRUCTION SUPERVISION AND CONTROL Role of supervisors in the construction site. Importance of quality control for construction work. Inspection and Supervision-techniques for different items of works such as earth-work, concreting, wood work, form-work, brick masonry, stone masonry, steel work, painting, water proofing, sanitary and water supply services.	6	4	3
5.3 CONSTRUCTION SAFETY Concept of Safety Management, Importance of safety in construction work. Causes of accidents and remedial measures. Precautions to be taken to avoid accidents. List of safety clothing and equipment needed at construction site. Importance and contents of first aid kit.	6	4	4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Construction business	8	15
2	Management of human resources	10	12
3	Capital management	10	12
4	Construction project management	10	18
5	Socio economic aspects	10	18
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

Intellectual skills:

1. Identify components of construction business
2. Recommend procedure for storage and handling material at site
3. Prepare various check lists.
4. Plot the critical path.

Motor Skills:

1. Draw bar charts.
2. Prepare Detailed layout of site
3. Prepare material and labour schedules
4. Draw site organization charts.

No	Practical	Marks
	Site Layout for following works (any 1) 1. Multi-storey building 2. Bridge works 3. Road works 4. Tunnelling works	5
	Bar chart for following works (same 1) 1. Multi-storey building 2. Bridge works 3. Road works 4. Tunnelling works	5
	Labour and material schedule for following works (same 1) 1. Multi-storey building 2. Bridge works 3. Road works 4. Tunnelling works	5
	Site organization chart	5
	Storage of materials at site	
	2 problems on CPM	5
No	**Practical Assignments**	**Marks**
1	Check lists for quantity of materials, of different items of works	5
2	Check lists for tools of different items of works	5
3	Check lists for safety measures, of different items of works	5
4	Check lists for quality of different items of works	5
5	Check lists for execution of different items of works	5
No	**Tutorial Exercise**	**Marks**
...	Total	50

9. LEARNING RESOURCES

Textbooks

S. No.	Author	Title of Books	Publishers
1	Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
2	O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New Delhi
3	S Galbert and B.M Dhir	Construction Planning and Management	Willey Easter Ltd Publication – Delhi
4	Rustom S. Davar	Industrial Management	Khanna Publication
5	Banga & Sharma	Industrial Organisation & Management	Khanna Publication
6	Jhamb & Bokil	Industrial Management	Everest Publication , Pune
7	Haripal Singh	Construction Management & Accounts	Tata Publication –New Delhi

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Robert L. Parity	Construction planning, equipment and method	Tata Mac- hill publication, New Delhi
2	Andrew R. McGill	The process of Management	Prentice- Hall
3	V.K. Raiva	Construction Management Practice	Tata Mac- hill publication, New Delhi
4	Vazirani and Chavdale	Construction Management and Accounts	Khanna Publication- Delhi
5	Anarjit Agarwal	Construction Management and P.W.D. Accounts	.K. Kateria and Sons

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1	IS 3764 - 1966	Safety code for excavation	Bureau of Indian Standards
2	3 IS 3696 (part I & II) 1966	Safety code for ladders & scaffolding	Bureau of Indian Standards
3	IS 1647-1960	Code of particle for fire safeties of buildings	Bureau of Indian Standards
4	IS 4081-1986	Safety code for blasting and sealed drilling operations	Bureau of Indian Standards
5	National building codes		

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI612) SOLID WASTE MANAGEMENT

1. COURSE OBJECTIVES:

The students will able to analyze the solid waste, suggest the treatment for solid waste and hazardous waste. The student will also be able to give suggestions in the solid waste management.

2. TEACHING AND EXAMINATION SCHEME

Semester	VII								
Course Code & Course Title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
		L	T	P	H	TH	TM	TW	PR/OR	
CI 612 Solid Waste Management		3	0	2	5	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO612.1. Discuss, Recognize, significance and implication of municipal solid waste

CO612.2. Interpret properties of municipal solid waste

CO612.3. Analyze and inspect for appropriate solutions to hazardous waste problems

CO612.4. Plan and Estimate generation, collection, processing and disposal of municipal solid waste

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society,Sustainability & Environment	Project Management	Life -long Learning
CO612.1	1	1	1	2	3	2	2
CO612.2	1	-	-	2	3	1	3
CO612.3	2	2	2	2	2	2	2
CO612.4	2	2	2	2	3	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO612.1	3	3
CO612.2	3	3
CO612.3	3	3
CO612.4	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: MUNICIPAL SOLID WASTE					
1.1 SOURCES Definition of MSW, Sources of solid waste, Types of solid waste			6	4	1
1.2 COMPOSITION Composition of solid waste and its determination. Types of materials recovered from MSW			6	4	1,2
UNIT 2: BASIC PROPERTIES					
2.1 BASIC PROPERTIES OF SOLID WASTE Physical properties of Municipal Solid Waste, Chemical properties of Municipal Solid Waste, Biological properties of Municipal Solid Waste			6	4	1,2
2.2 TEMPORAL PROPERTIES OF SOLID WASTE Causes and effects of Waste degradation, Transformation of Municipal Solid Waste with time, effect of rains on MSW, formation and effects of leachate, containment of leachate			6	4	1,2
UNIT 3: GENERATION & COLLECTION					
3.1 SOLID WASTE GENERATION Quantities of Solid Waste. Measurements and methods to measure solid waste quantities. Solid waste generation. Factors affecting solid waste generation rate.			6	4	1,3
3.2 SOLID WASTE COLLECTION Necessity and methods of Solid waste collection. material recovery from MSW			6	4	2,4
3.3 HANDLING Handling and separation of solid waste At site. Material separation by pick in, screens, float and separator magnets and electromechanical separator. Waste handling and separation at Residential, Commercial and industrial facilities. Storage of solid waste at the sources			9	4	3,4

UNIT 4: PROCESSING & DISPOSAL			
4.1 PROCESSING OF SOLID WASTE Processing of solid waste at residence e.g. Storage, conveying, compacting, Shredding, pulping, granulating etc. Processing of solid waste at Commercial and industrial site.	6	4	1,4
4.2 DISPOSAL OF SOLID WASTE Combustion and energy recovery of municipal solid waste, effects of combustion, undesirable effects of Combustion. Biochemical processes: Methane generation by anaerobic digestion, composting and other biochemical Processes	6	4	4
4.3 LANDFILL Definition, Classification, planning and location of landfill. Landfill design. Landfill operation. Use of old landfill. Differentiate sanitary land fill and incineration as final disposal system for solid waste.	6	4	4
UNIT 5: HAZARDOUS WASTE			
5.1 HAZARDOUS SOLID WASTE Definition, identification and classification of hazardous solid waste. Characteristics of Hazardous waste (toxicity, reactivity, infectiousness, flammability, radioactivity, corrosiveness, irritation, bio-concentration, genetic activity, explosiveness).	6	4	1,3
5.2 BIO-MEDICAL WASTE Bio-medical waste, its sources, generation, storage, transportation and Disposal	6	4	1,3,4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Municipal Solid Waste	8	12
2	Basic Properties	8	12
3	Generation &Collection	12	21
4	Processing &Disposal	12	18
5	Hazardous Waste	8	12
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical	Marks
1	Survey the MSW of your locality and identify its sources and write composition of MSW	2
2	Survey your locality and based on it suggest methods of solid waste collection	2
3	Survey your locality and based on it suggest suitable methods of handling, separation and storage of solid waste	2
4	Identify Compare & discuss the methods of processing different types of solid waste (search internet for latest methods).	2
5	Identify methods of hazardous waste disposal during a site visit and follow safety precautions	2
6	Report of visit to solid waste treatment plant	2
7	Prepare 2 charts and 2 models of different method of treatment of MSW	2
8	Sketch flow chart and explain Waste handling and separation at Commercial facilities	2
9	Sketch flow chart and explain Waste handling and separation at industrial facilities.	2
10	Sketch flow chart and explain Waste handling and separation at Residential facilities	2
No	**Class Room Assignments**	**Marks**
1	At least 10 covering all units above	5
	Total	**25**

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	George Tchobanoglous and Hillary Theisen, Samuel Vigil	Integrated solid waste management	McGraw Hill
2	P AarneVesilig	Solid Waste Management	Cengage Learning

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Mackenzie L Davis, David A Cornwell	Environmental Engineering	McGraw Hill Education
2	Michael E Henstock	Disposal and recovery of municipal solid waste	Butterworth-Heinemann Ltd

Internet and Web Resources

S. No.	Author	Title of Books	Publishers
1		http://www.cyen.org/innovaeditor/assets/Solid%20waste%20management.pdf	
2		www.houstontx.gov/solidwaste	
3		http://www.ilo.org/oshenc/part-vii/environmental-pollution-control/item/514- solid-waste-management-and-recycling	
4		en.wikipedia.org/wiki/waste management	

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 613) TRANSPORTATION ENGINEERING II

1. COURSE OBJECTIVES:

The student will be able to know the components parts of harbours, airports, railways and tunnels. The student will also be executing the construction of harbours, airports, railways and tunnels.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VII**								
Course Code & Course Title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
CI 613 Transportation Engineering II		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO613.1. Comprehend and Identify criteria needed for transport infrastructure and its design

CO613.2. Sketch transport infrastructure

CO613.3. Inspect, Conduct experiments and tests, for transport infrastructure

CO613.4. Propose and Plan construction infrastructure

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO613.1	1	-	-	1	2	2	1
CO613.2	1	-	-	-	-	-	-
CO613.3	2	2	2	2	2	2	2
CO613.4	1	2	2	3	3	2	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO613.1	2	2
CO613.2	1	1
CO613.3	3	3
CO613.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: DOCKS AND HARBOURS					
1.1 HARBOURS Definition, necessity, types, Natural and artificial harbours,			6	1	1
1.2 DOCKS Definition, types, shape of docks and basins, location, design consideration, dock entrances, repair docks(dry docks, floating docks, marine railway, lift docks), jetties				2	1
1.3 OTHER STRUCTURES Entrance locks, lock gates, Quays, transit sheds, warehouses			6	2	1,4
UNIT 2: AIRPORT ENGINEERING					
2.1 AIRPORT PLANNING AND DESIGN History of Airport Engineering, Aircraft types & general characteristics, Airport Classification, Airport Master Planning			6	4	1,4
2.2 AIR TRAFFIC CONTROL AND AIRPORT CAPACITY Airways and navigation systems; Air Traffic Control Systems. Air Cargo Terminals, Airport Capacity (Practical capacity and ultimate capacity, Gate capacity)			6	4	1,4
2.3 OTHER FACTORS Environmental Factors, Land use compatibility, Land use planning, Social factors, Airport security, Runway protection,			6	4	1,4
UNIT 3: AIRPORT DESIGN					

3.1 AIRPORT AND AIRFEILD CONFIGURATION Principles of Airport configuration, different Airport Configuration, Runway configuration, types and capacities, Runway length, Takeoff &landing distance; definition with sketch of (Holding bays; Holding aprons, wind rose, exit taxiway, runway spacing; taxiways and taxi-lanes; apron area, Lighting and Marking).	6	4	1,2,3
3.2 TERMINAL SYSTEM Terminal concepts; terminal components; Passenger and baggage processing system; sketch of (Airport Terminal Configurations, airport parking Configurations)	6	4	1,2,4
3.3AIRPORT PAVEMENTS General procedure for Pavement Design (Flexible and Rigid)	6	4	1,2,4
UNIT 4: RAILWAY ENGINEERING			
4.1 PERMANENT WAYS Ideal requirement, component parts. Function, types. & suitability (Rails, Rail Joints, Sleepers, Ballast) definition with sketch of Rail fixtures & fastenings (fish plate, bearing plates, spikes, bolts, keys, anchors & anti creepers).	6	4	1,2,3
4.2 ALIGNMENT AND GAUGES Classification of Indian Railways, zones of Indian Railway. Factors governing rail alignment. Factors affecting selection of gauge. Rail track cross sections – standard cross section of BG & M.G Single & double line in cutting and embankment	6	4	1,2,4
4.3 STATION AND YARDS Requirements of railway station, Types of stations (way side, crossing, junction & terminal) definition and types of (station yard, Passenger yards, Goods yard, Locomotive yard, Marshalling yard).	6	3	1,2,4
4.4 TRACK MAINTENANCE Necessity, types, Tools required and their function, duties of (permanent way inspector, gang mate, key man)		3	1,2,4
UNIT 5: TUNNELLING			
5.1 INTRODUCTION Typical cross-sections, Clearance diagram for rail and road tunnels, types of lining, methods of drainage.	3	2	4
5.2 TUNNEL CONSTRUCTION Alignment of tunnel- factors affecting the alignment. Setting out for the tunnel. Method of tunnelling operation in hard rock and in soft ground, safety precautions in tunnelling. Introduction to tunnel boring machine(TBM)	6	3	3,4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Docks and Harbours	5	12
2	Airport Engineering	12	18
3	Airport Design	12	18
4	Railway Engineering	14	18
5	Tunnelling	5	9
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	**Practical**(Sketch book with sketches of following-include visit to nearest facility)	Marks
1.	**Docks and Harbours(Any two)** Dry docks, Floating docks, Marine railway, Lift docks Jetties	3
2.	**Airport(Any Four)** Airport Master Plan Air Cargo Terminals Holding bays; Holding aprons, Exit taxiway, Runway Pattern Taxiways apron area, Airport Lighting Airport Marking	7

3.	**Railway (Any Five)** Rails, Rail Joints, Sleepers, Fish plate, Bearing plates, Spikes, Bolts, keys, anchors anti creepers Station yard, Passenger yards, Goods yard, Locomotive yard, Marshalling yard Standard cross section of BG Single line in cutting and embankment Standard cross section of M.G double line in cutting and embankment Standard cross section of BG Single line in cutting and embankment Standard cross section of M.G double line in cutting and embankment	7
4.	**Tunnelling** Typical cross-sections of tunnels,	3
No	**Class Room Assignments**	**Marks**
1	At least 5 covering all units above	5
No	**Tutorial Exercise**	**Marks**
...	Total	25

9. LEARNING RESOURCES: Text Books

S. No.	Author	Title of Books	Publishers
1	S.C. Saxena	Railway Engineering	Dhanpatrai& sons
2	K.R. Antia	Railway Track	The New Book Co. Pvt. Ltd Mumbai
3	Robert Horonjeff, Francis McKelvey, William Sproule and Seth Young	Planning and Design of Airports: 5th Edition	McGraw-Hill 2010

4	Norman J. Ashford, Saleh, Mumayiz, Paul H. Wright	Airport Engineering: Planning, Design, and Development	John Wiley & Sons.INC
5	R Shrinivasan	Harbour dock and tunnel engineering	Charotar book stall

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	S.C. Rangwala	Principles of Railway Engineering	Charotar Publication
2	Alastair Gordon	Naked Airport	Metropolitan Books
3	Marcus Binney	Airport Builders	John Wiley & Sons
4	Brian Edwards	The Modern Airport Terminal: New Approaches to Airport Architecture	Taylor & Francis
5	Walter Hart	The Airport Passenger Terminal	Krieger Publishing Company

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 614) CONSTRUCTION ADVANCED

1. COURSE OBJECTIVES:

The course content is designed to give various aspects of modem and advanced methods of construction of Civil Engineering. This course stresses on construction activities other than the normal buildings and houses that an engineer comes across.

2. TEACHING AND EXAMINATION SCHEME:

Semester	VII								
Course Code & Course Title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
CI 614 Construction Advanced		L	T	P	H	TH	TM	TW	PR/OR	
		3	0	2	5	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO614.1. Recognize and Adopt appropriate method for Deep trench excavation and dewatering technique

CO614.2. Operate proper equipment to execute the work of structural demolition

CO614.3. Appraise, Inspect and Supervise the construction of formwork, and special aspects of construction and construction Machinery

CO614.4. Assess and Plan perform special concrete and concreting and operations

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO614.1	1	1	1	2	2	2	1
CO614.2	2	2	2	2	2	1	1
CO614.3	2	-	-	3	1	2	3
CO614.4	1	2	1	3	3	2	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO614.1	1	1
CO614.2	3	2
CO614.3	3	3
CO614.4	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: BASEMENTCONSTRUCTION					
1.1 BASEMENTS Definition and purposes of basement construction, types of basements			3	1	3
1.2 DEEP TRENCH EXCAVATION Narrow deep trench excavation, excavation methods as open excavation method, racking strut method, Perimeter trench method, Diaphragm wall method. Dewatering methods, well point systems,			6	4	1,3
1.3 COFFERDAMS Functions and requirements, Types of cofferdams construction and applications.			3	2	3
UNIT 2:SPECIAL CONCRTE AND CONCRETING METHODS					
2.1 UNDER WATER CONCRETING Underwater concreting for bridge piers and bored pile construction. Tremie method of under- water concreting. Procedure and equipment required for tremie method. Properties, workability and water cement ratio of the concrete required.			6	5	1,2,3, 4
2.2 READY MIX CONCRETE Necessity and use of Ready Mix Concrete. Production and equipment's for RMC. Ready Mix Concrete plant. Conveying of RMC. Transit mixers- working and time of transportation. Workability and water cement ratio for RMC.			6	3	3,4
2.3 TREMIE CONCRETING METHOD Definition, application of vacuum dewatering concreting. Equipment used in tremie concreting. Procedure of vacuum dewatering concreting (Tremie).				3	1,3,4

2.4 SPECIAL CONCRETES Properties, uses and procedure of Roller compacted concrete. Properties and uses of High Impact Resisting concrete. Properties, uses and constituents of Steel fiber reinforced concrete. Percentage of steel fibers in SFRC. Effect of size, aspect ratio and percentage of steel fibers on strength of concrete.	6	3	4
UNIT 3: ADVANCED CONSTRUCTION METHODS			
3.1 FORMWORK Steel Formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork. Slip formwork- meaning, use of slip formwork. Process of concreting with slip forms.	6	4	3,4
3.2 CONSTRUCTION OF MULTI-STOREYED BUILDINGS Use of lifts, belt conveyors, Pumped concrete, Equipment and machinery required for construction of Multi-storeyed Buildings. Precautions and safety measures.	3	3	2,3,4
3.3 PREFABRICATED CONSTRUCTION Meaning of prefabrication and precast. Methods of prefabrication- plant Prefabrication and site prefabrication. Linear members, rigid frames, roofing and flooring members, R.C. Doors and windows, wall panels, Jointing of structural members.	6	3	3,4
3.4 SOIL REINFORCING TECHNIQUES Necessity of soil reinforcing, Use of wire mesh and geo-synthetics. Strengthening of embankments, slope stabilization in cutting and embankments by soil reinforcing techniques	6	3	3,4
3.5 INDUSTRIAL STRUCTURE ROOFING SYSTEMS Daylight factors, North light roofing, Monitor roof, Lattice Truss, portal frames	3	3	1,3,4
UNIT 4: DEMOLITITION AND SAFETY ASPECTS			
4.1 INTRODUCTION Necessity of structural demolition, Survey of Structure, Safety measures. Demolition methods, hand demolition, pusher arm methods	3	2	1,2
4.2 DEMOLITION METHODS Hand demolition, pusher arm methods, demolition ball, rope pulling, Sequence of demolition of load bearing structure ,and framed structure	6	3	2,4
UNIT 5: SPECIAL ASECTS OF CONSTRUCTION			
5.1 WATERPROOFING Introduction, Necessity of water proofing, waterproofing methods, cobba water proofing, Chemical waterproofing, Membrane water proofing, integral water proofing,	6	3	3,4

5.2 CLADDING AND INFILL PANELS Objects of cladding, Tile cladding, Stone Cladding ACP claddings glass claddings, metal Cladding, AC sheet claddings.	6	3	3,4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Basement Construction	07	12
2	Special Concrete and Concreting Methods	14	18
3	Advanced Construction Methods	16	24
4	Demolition and Safety Aspects	05	09
5	Special Aspects of Construction	06	12
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical (Any 5)	Marks
1	Visit the construction excavation site prepare the brief report	3
2	Study of special type of formwork.	3
3	Prepare fibre reinforced concrete.	3
4	Case study on reinforced earth constructions	3
5	Visit to RMC unit, and prepare the brief report.	3
6	Demonstrate cladding materials, and construction.	3
7	Prepare and Apply Waterproofing Compounds	3
No	**Class Room Assignments**	**Marks**
1	At least 10 covering all units above	10
No	**Tutorial Exercise**	**Marks**
...	**Total**	**25**

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	S.K Sharma	Building construction	S.Chand Publication
2	R. Chudly	Construction Technology Vol. I to IV	ELBS- Longman Group
3	R.L. Peurifoy	Construction Planning, equipment and methods	McGraw-Hill Co. Ltd.
4	S. Seetharaman	Construction Engineering and Management	Umesh Publication, New Delhi.
5	B. Sengupta and Guha	Construction Management and Planning	Tata McGraw Hill
6	M. L. Gambhir	Concrete Technology(Third Edition)	Tata McGraw Hill
7	R. C. Smith	Materials of construction	Tata McGraw Hill
8	TTTI Madras	Building Technology and valuation	TTTI Madras
9	Satyanarayana and S. C. Saxena	Construction Planning and Equipment	Standard Publication NewDelhi
10	TTTI Chandigarh	Civil Engineering Materials	TTTI Chandigarh
11	S. C. Rangawala	Construction of Structures and Management of Works	Charotar Publication

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Govt. of Maharashtra PWD	Handbooks for –Materials, Foundation - Construction equipments	Govt. of Maharashtra PWD
2	Khanna Publication	Practical Civil Engineering Handbook	Khanna Publication

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd’s of above experiments.	If any
2	NPTEL	video cassettes or cd’s of above experiments.	If any

(CI 622) HOUSE PLUMBING AND SANITATION

1. COURSE OBJECTIVES:

The students will able to draw detailed plumbing systems, understand the type of pipes, fixtures, joints, connections, and detect the faults and carryout the repair. They will be able to carry out the house plumbing for residential units and perform multiple service connections.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VII**								
Course Code & Course Title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**	**Total Marks**
CI 622 House Plumbing and Sanitation		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**25**	**150**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO622.1. Identify pipes, Selection of pipes, fixing joining

CO622.2. Perform the right procedure for fresh water, waste water plumbing

CO622.3. Identify the Sanitary fixtures and follow the right fixing methods

CO622.4. Design a septic tank and STP and fire safety service.

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO622.1	1	-	-	1	3	2	3
CO622.2	1	2	2	1	2	3	2
CO622.3	1	1	1	1	2	1	2
CO622.4	2	2	2	2	3	2	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO622.1	2	2
CO622.2	2	2
CO622.3	2	2
CO622.4	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching Hours**	**CO = Course Objectives**			
			M	**Thr**	**CO**
UNIT 1: BUILDING WATER SUPPLY SERVICES					
1.1 INTRODUCTIONS: Types of buildings, Building construction in India comfort Standards, Buildings orientation, Installation of services, Elements of plumbing, The role of a plumber.			9	3	1
1.2 PLUMBING HYDRAULIC AND PNEUMATICS Introduction- Principles of plumbing- Plumbing hydraulics and Pneumatics- General Properties of water- Static water pressure – Pascal's Law- Atmospheric Pressure- Flow of Water- Residual head of water- Bernoulli's theorem- Loss of head in pipes- Important flow formulae- Effects of Friction head loss- Relative holding and discharge capacity- Equivalent pipes- Composite pipes- Air locks and cavitation.				6	1
1.3 BUILDING WATER SUPPLY SYSTEM Conveyance of water- Per capita supply- Service connections from mains- Ferrule- Storage of water- Sizing of pipes- Principles of sizing pipes- Probability of simultaneous use of fixtures- Installation of pipes and fittings- Storage tanks for bungalows- water meters...			6	3	2
1.4 HOT WATER SUPPLY Introduction- Quantity of hot water- Size of vessel for storage- Types of heaters- Pressure and Non-pressure types- Tank-less water heaters- Geysers- Central hot water system- Hot water piping layout- Principles of design- Return circulation system- Solar Thermal Energy- Solar type water heaters- Testing of the system				3	2

UNIT 2: PIPES, JOINTS, FITTINGS			
2.1 WATER SUPPLY PIPES GI Pipes, copper pipes, stainless-steel pipes, plastic pipes LDPE-Rigid pipes and their joints CPVC pipes green PPRC, Composite pipes, PEALPE, UNIPIPE jointing materials. Testing of water pipes.	6	3	1
2.2 VALVES AND TERMINAL FITTINGS Valves and Functions of valves-Bibcock, Ball valves, Butterfly valves, Gate valves, Globe valves Sluice valves, scour valves, Valve head, Reflux valves, Flap valves, pressure relief valves Pressure reducing valves, pressure sustaining valves Air valves. Terminal fittings-pillar taps-Bib taps and stop valves -Self closing valves—Shower rose- Mixing valves Flushing valves Aerated faucets—waste coupling—position of terminal fittings.	6	4	1
UNIT 3: BUILDING DRAINAGE SERVICES			
3.1 SANITARY FIXTURES/TRAPS Introduction- Classification of sanitary fixtures- Ablution fixtures- Washbasins- Sinks- Kitchen, Janitor- Bathroom fixtures- Shower trays- Bathtubs- Soil fixtures- Water Closets-EWC- Floor and Wall mounted- Indian water closet- Anglo –Indian water closets- Urinals-Bowl-Stall-Aqua free- Squatting plate- Bidet- Slop sinks- Accessories- Flushing cisterns- various types- Drinking fountains- Water coolers- Bathroom accessories- Soap trays- Shelves- towel rail- mirrors- hand dryers- Sanitary towel disposal unit- Materials of sanitary fixtures- Vitreous china, Acrylic. Different types of traps.	9	6	3
3.2 DRAINAGE SYSTEM AND ITS WORK PROCEDURES Introduction, Scope for Drainage System. Classification of Drainage System, Construction Sequence Flow Chart for Drainage Work. Checking and Testing of Drainage and Pipes. Causes of Leakages General Precautions for Drainage Works Test of Joints, Testing of Linearity, Verticality and Slopes.	6	3	3
3.3 INTERNAL DRAINAGE SYSTEM Choice of System, Procedures for Fixing Vertical Stacks, Various Fittings their uses and Work Procedure, Important Guidelines for Joining P.V.C. Pipes, Incorrect Usages by the Occupant.	6	3	3
3.4 EXTERNAL DRAINAGE SYSTEM Types of Sewer Pipe, Fixtures and Fittings, Procedure for Laying Sewer Pipes, Construction and Finishing of Chambers, Construction and Finishing of Manholes.		3	3
3.5 MAINTENANCE Uses and Maintenance of Plumbing and Sanitary Systems and. Do's and Don'ts for Drainage.	3	2	3

UNIT 4 SEPTIC TANK			
4.1 INTRODUCTION Design Aspect, Construction of septic Tanks, Functioning of Septic Tanks, Soak Pit, Sullage Line, Septic Tank for housing Colony, Up flow Filter Chamber	9	4	4
4.2 OPERATION Maintenance of Septic Tanks, Flow Chart for Septic Tank Working, cleaning of clogged and overflowing tanks		02	4
UNIT 5: ANCILLARY SERVICES			
5.1 STP (SEWAGE TREATMENT PLANT) Introduction, functions of STP, STP for small housing colony, Large STP for Industrial Units.	6	4	4
5.2 FIRE PROTECTION SYSTEM: Fire protection-Requirements of water-system of firefighting, external internal wet and dry risers-Sprinkler System-Industrial Firefighting System	6	3	4
Total	**75**	**48**	**-**

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies, Practical

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	Building Water Supply Services	12	15
2	Pipes, Joints, Fittings	7	12
3	Building Drainage Services	16	24
4	Septic Tank	6	12
5	Ancillary Services	7	12
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Hours	Marks
1	Study of plumbing tool and Safety tools	02	2
2	Study and Identification of pipes and class of water supply pipes	02	2
3	Study and Identification of different types of valves and connections	04	2
4	Working with terminal fittings and repair of terminal fittings	04	2
5	Pipe cutting, joining fixing, (role of union, couplers T, elbow, cross, etc)	04	2
6	Understanding and making CID joints, union joints	02	2
7	Demonstration Latest plumbing fixtures, Diverters, High flow diverters.	02	2
8	Reading and interpretation of house plumbing drawing	06	2
9	Prepare a layout for fresh water plumbing (for a residential units)		
10	Prepare a layout for waste water plumbing (for a residential units)		
11	Design and draw small STP	04	4
No	**Class Room Assignments**		**Marks**
1	At least 05 covering all units above		5
		Total	25

9. LEARNING REFSOURCES Text

Books

S. No.	Author	Title of Books	Publishers
1	S,M Patil	Building Services	B Printers Mumbai
2	S.K Garg	Sanitary Engineering	Khanna Publishers.
3	G.S. Birdie	Water Supply and Sanitary Engineering	Tata McGraw Hill.
4	S. C. Rangwala	Water Supply And Sanitary Engineering	Charotar Publications
5	Ashok Kumar Jain and B.C. Punmia	Waste Water Engineering	Laxmi Publication(P)LTD
6	Peter A. Hemp	Installing & Repairing Plumbing Fixtures	Taunton(August 1994)

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	R,D,Treloar	Plumbing Encyclopaedia	Wiley Blackwell
2	Roy Treloar	Plumbing	Wiley Blackwell
3	IPA	Uniform Plumbing code	

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI 625) SUSTAINABLE DESIGN OF BUILDINGS

1. COURSE OBJECTIVES:

The students will able to analyze the building materials and products whether they are green or not and select Proper materials and products for sustainable building design. The students shall understand the basic principles of design of green buildings.

2. TEACHING AND EXAMINATION SCHEME:

Semester	**VII**								
Course Code & Course Title		**Periods/Week (in hours)**			**Total Hours**	**Examination Scheme**			
						Theory Marks		**Practical Marks**		**Total Marks**
CI 625 Sustainable Design of Buildings		**L**	**T**	**P**	**H**	**TH**	**TM**	**TW**	**PR/OR**	
		3	**0**	**2**	**5**	**75**	**25**	**25**	**25**	**25**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO625.1. Discuss concept of sustainability and green construction

CO625.2. Interpret and assess the indoor quality and manage water effectively

CO625.3. Inspect and analyze the building materials correctly for energy and carbon footprint,

CO625.4. Propose and Plan Select proper operations, materials and products for sustainable construction

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO625.1	1	-	-	1	3	2	3
CO625.2	1	2	2	1	2	3	2
CO625.3	1	1	1	1	2	1	2
CO625.4	2	2	2	2	3	2	3
Total	**5**	**5**	**5**	**5**	**10**	**8**	**10**

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO625.1	2	2
CO625.2	2	2
CO625.3	2	2
CO625.4	3	3
Total	**9**	**9**

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN:

M = Marks	**Thr = Teaching hours**	**CO = Course Objectives**			
Unit			**M**	**Thr**	**CO**
UNIT 1: SUSTAINABILITY AND GREEN BUILDINGS					
1.1 INTRODUCTION TO SUSTAINABILITY Definition – Sustainable Development, sustainable construction, sustainable design, ecological design and green design. Major environmental and resource concerns. Green building movement.			9	4	1
1.2 GREEN BUILDINGS Green Building concept. Major Green Building Assessment systems used in India and internationally (LEED, BREEAM, GRIHA, US Green Building Council, Green Globes Building Assessment System). The integrated design process. Green building documentation required.			9	8	1
UNIT 2: ENERGY AND CARBON FOOTPRINT					
2.1 BUILDING ENERGY Building energy issues. Building envelope, internal load reduction. Active mechanical systems, water heating systems, electrical power systems, energy optimization, renewable energy systems, fuel cells, smart buildings and energy management systems.			9	6	3
2.2 CARBON FOOTPRINT Ozone depleting chemicals in HVAC & R systems. Reducing the Carbon footprint			6	5	3
UNIT 3: WATER AND INDOOR QUALITY					
3.1 WATER MANAGEMENT Global water resource depletion. Water distribution systems. Hydrological cycle. Designing high performance building hydrological cycle. Water budget rules. Sustainable storm-water management. Landscaping water efficiency.			9	6	2

3.2 INDOOR ENVIRONMENTAL QUALITY Indoor Environmental Quality issues. Integrated Indoor Environmental quality design. Emissions from building materials. Economic benefits of good IEQ	6	4	2
UNIT 4: CONSTRUCTION OPERATIONS AND COMMISSIONING			
4.1 PLANNING Site Protection Planning. Managing indoor air quality during construction. Construction materials management. Construction and demolition waste management. Commissioning	6	5	4
4.2 COMMISSIONING Essentials of Building Commissioning. HVAC system commissioning. Commissioning of non-mechanical systems. Costs and benefits of building commissioning.	9	5	4
UNIT 5: SUSTAINABLE CONSTRUCTION			
5.1 SUSTAINABLE CONSTRUCTION The economics of green building. Quantifying green building benefits. Performance Goals for future green buildings. The challenges ahead. Enhancing ecosystems, rainwater harvesting, and pollution reduction.	6	3	1,4
5.2 GREEN PRODUCT AND MATERIALS Green building product, green building materials, substitution of by products in concrete for green concrete, using recycled products and mine waste in soil for green foundations.	6	2	3,4
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of Lectures	Marks
1	sustainability and green buildings	12	18
2	Energy and carbon footprint reduction	11	15
3	Water and indoor quality	10	15
4	Construction operations and commissioning	10	15
5	Sustainable construction	5	12
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS:

No	Practical	Marks
1.	Drawings for below	
No	**Class Room Assignments**	**Marks**
1	The term work comprises of analysis of any six case studies a) A project rated by/as-per LEEDS b) A project rated by/as-per GRIHA c) Study of green material and green products d) Termite mound building concept e) Stormwater management in a building f) Internal Load/Energy reduction measures in a single storey building g) Carbon footprint of a single storey building h) Study of smart building i) Indoor Air Quality improvement in an existing single-story building j) Managing indoor air quality at construction site k) Reduction and management of Construction and Demolition waste at the construction site l) Study of nature-mimicry adapted for green building	20
2	At least 04 assignments on unit given above	05
	Total	25

9. LEARNING RESOURCES:

Text Books

S. No.	Author	Title of Books	Publishers
1	APV-CT	Lecture and Practical Notes on Sustainable Buildings for polytechnic students	ACTXAN-Verna
2	Charles J. Kibert	Sustainable construction – building design and delivery	John Wiley Publishing Inc
3	Thomas W. Cook Ann Marie Van Der Zanden	SUSTAINABLE Landscape Management Design, Construction, and Maintenance	John Wiley Publishing Inc
4	Loren E. Abraham, et. al	Sustainable Building technical Manual - Green Building Design, Construction, and Operations	Public Technology Inc., USBC

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(CI626) ENTREPRENEURSHIP IN CIVIL ENGINEERING

1. COURSE OBJECTIVES:

The students will able to. Identify civil entrepreneurship opportunity. Acquire civil entrepreneurial values and attitude. Use the information to prepare project report for civil business venture. Develop awareness about civil enterprise management

2. TEACHING AND EXAMINATION SCHEME

Semester	VII								
Course code & course title		Periods/Week (in hours)			Total Credits	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
CI626		L	T	P	C	TH	TM	TW	PR/OR	
Civil Enterprise		3	0	2	5	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:
CO626.1. Comprehend, Identify and Categorize entrepreneurship opportunity and manage finances
CO626.2 Acquire and Demonstrate entrepreneurial values and attitude
CO626.3Analyze and Employ the information to prepare project report for business venture,
CO626.4 Manage, Formulate and Plan a Civil Engineering enterprise

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentation& Testing	Engg. Practices for Society,Sustainability& Environment	Project Management	Life -long Learning
CO626.1	2	-	-	2	2	3	3
CO626.2	2	1	1	2	3	3	3
CO626.3	2	1	1	1	2	3	3
CO626.4	2	2	2	2	2	3	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO626.1	3	3
CO626.2	3	3
CO626.3	3	3
CO626.4	3	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**TH = Teaching hours**	**CO = Course Objectives**			
UNIT			**M**	**TH**	**CO**
1 FUNDAMENTALS OF ENTREPRENEURSHIP					
1.1 INTRODUCTION TO STARTUPS Concept of entrepreneur and start-ups, Classification & Characteristics of Entrepreneur, concept of civil enterprise, traits of a successful Entrepreneur.			3	2	1
1.2 CREATIVITY Creativity and Risk taking, Business Ideas in the construction industry, Visualizing construction business, Kinds of Risks, Business Idea Methods and techniques to generate business idea, Activity Map for a civil enterprise,			6	2	2
1.3 OPPORTUNITIES Transforming Ideas in to opportunities (Idea to Start-ups), Assessment of idea & Feasibility of opportunity, SWOT Analysis				2	1,3
2 INFORMATION & SUPPORT SYSTEMS					
2.1 INFORMATION NEEDED AND THEIR SOURCES. Collecting and compiling Information required for civil projects, Information related to support system, Information related to procedures and formalities for starting a civil enterprise.			9	4	1
2.2 SUPPORT SYSTEMS Small Scale civil Business Planning and Requirements, Govt. & Private Institutional Agencies involved and their rules and regulations, Statutory Requirements and Agencies for a civil enterprise.				4	1
2.3 MARKET ASSESSMENT Marketing –Concept and Importance, Market Identification, Survey of Key components, Market Assessment, Identifying Target Markets for civil start-ups.			6	4	1,3
3 BUSINESS FINANCE & ACCOUNTS					
3.1 BUSINESS FINANCE FOR CIVIL ENTERPRISE Cost of Civil Project, Sources of Finance, Assessment of working capital, Project costing, Profitability, Break-Even Analysis. Communication of idea to potential investors, Financing available for start-ups.			6	4	1
3.2 ACCOUNTING PRINCIPLES, METHODOLOGY Business Account, Book Keeping, Financial Statements, Concept of Audit			6	4	1

3.3 TAXATION Types of taxes involved in a civil enterprise, taxation authorities, recovery and payment of taxes, Patenting & Licensing.	6	4	1
4 BUSINESS PLAN & PROJECT REPORT			
4.1 BUSINESS PLAN Steps involved from concept to commissioning of a Civil Enterprise Business Plan. Activity, Recourses, Time and Cost of a Civil Enterprise Business Plan.	6	4	4
4.2 PROJECT PROPOSAL Meaning and Importance, Components of Project Proposal (Give list)	6	4	3
4.3 PROJECT APPRAISAL Meaning and definition, Technical and Economic feasibility, Cost benefit Analysis	6	4	3
5 ENTERPRISE MANAGEMENT & MODERN TRENDS			
5.1 ENTERPRISE MANAGEMENT : - Basic structure of company**,** Essential roles of Entrepreneur in managing enterprise, Product Cycle: Concept And Importance, Probable Causes Of Sickness, Quality Assurance, Importance of Quality, Importance of testing, Recruitment , Management of Workforce.	9	4	4
5.2 MODERN TRENDS E-Commerce Concept and process, Global Entrepreneur	6	2	3
Total	**75**	**48**	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
1	Fundamentals of entrepreneurship	6	9
2	Information & support systems	12	15
3	Business finance & accounts	12	18
4	Business plan & project report	12	18
5	Enterprise management & modern trends	6	15
	Total	**48**	**75**

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Prepare a project report with following 1. Project Summary (One page summary of entire project) 2. Introduction (Promoters, Market Scope/ requirement) 3. Project Concept & Product (Details of product/construction/business) 4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength) 5. Manufacturing Process & Technology 6. Plant & Machinery Required 7. Location & Infrastructure required 8. Manpower (Skilled, unskilled) 9. Raw materials, Consumables & Utilities 10. Working Capital Requirement (Assumptions, requirements) 11. Market (Survey, Demand &Supply) 12. Cost of Project, Source of Finance 13. Projected Profitability &Break-Even Analysis 14. Conclusion.	18
	SWOT Analysis of a business plan	2
No	**Class room Assignments**	**Marks**
1	At least 10 covering all units above	5
...	Total	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	E. Gorden, K.Natrajan	Entrepreneurship Development	Himalaya Publishing.Mumbai
2	Colombo plan staff college for Technical education	Entrepreneurship Development	Tata McGraw-Hill
3	J.B.Patel, S.S.Modi	A Manual on Business Opportunity Identification & Selection	Tata Mc Graw Hill Publishing co. ltd. New Delhi.
4	S.B.Sareen H. Anil Kumar	National Directory of Entrepreneur Motivator & Resource Persons	Entrepreneurship Development Institute of India
5	Gautam Jain, Debmuni Gupta	New Initiatives in Entrepreneurship Education & Training	Entrepreneurship Development Institute of India
6	D.N.Awasthi , Jose Sebeastian	Evaluation of Entrepreneurship Development Programmes	SAGE Publications Pvt. Ltd

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	J.B.Patel, D.G.Allampally	A Manual on How to Prepare a Project Report	EDI STUDY MATERIAL Ahmadabad
2	P.C.Jain	A Handbook of New Entrepreneurs	
3	V.G.Patel	The Seven Business Crisis & How to Beat Them	
4	Poornima M. Charantimath	Entrepreneurship Development of Small Business Enterprises	Pearson Education, New Delhi
5		Entrepreneurship Development	McGraw Hill Publication
6	J.S. SainiB.S.Rathore	Entrepreneurship Theory and Practice	Wheeler Publisher New Delhi
7		Entrepreneurship Development	TTTI, Bhopal / Chandigadh

Videos and Multimedia Tutorials

S. No.	Author	Title of Books	Publishers
1	NITTTR	video cassettes or cd's of above experiments.	If any
2	NPTEL	video cassettes or cd's of above experiments.	If any

(AC 102) INDIAN CONSTITUTION

1. COURSE OBJECTIVES:

As a proud citizen of this country every student must be aware about the Indian Constitution to appreciate the provisions available for the people of this biggest democracy in Indian Constitution so that the youth of this country plays active role in development of the country by participating in the formation of sensitive and proactive Government at national and state level. This course intends to make students aware about various constituents of the Indian Constitution.

2. TEACHING AND EXAMINATION SCHEME:

Semester	VII								
Course Code & Course Title		Periods/Week (in hours)			Total Hours	Examination Scheme			
						Theory Marks		Practical Marks		Total Marks
(AC 102) INDIAN CONSTITUTION		L	T	P	C	TH	TM	TW	PR/OR	
		2	0	0	2	0	0	0	0	0

3. COURSE CONTENT

UNIT 1: The Constitution – Introduction

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation
- State Policy Principles

UNIT 2: Union Government

- Structure of the Indian Union
- President- Role and Power
- Prime Minister and Council of Ministers
- Lok Sabha and Rajya Sabha

UNIT 3: State Government

- Governor- Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

UNIT 4: Local Administration

- District Administration
- Municipal Corporation
- Zila Panchayat

UNIT 5: Election Commission

- Role and Functioning
- Chief Election Commissioner
- State Election Commissioner

Suggested Learning Resources:

S. No.	Title of Book	Author	Publication
1	Ethics and Politics of the Indian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi,2008
2	The Constitution of India	B. L. Fadia	Sahitya Bhawan; New edition (2017)
3	Introduction to the Constitution of India	D D Basu	Lexis Nexis; Twenty – Third 2018 edition

Suggested Software/ Learning Websites:

a. https://www.constitution.org/cons/india/const.html
b. http://www.legislative.gov.in/constitution-of-india
c. https://www.sci.gov.in/constitution
d. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/

DIPLOMA IN CIVIL (CONSTRUCTION) ENGINEERING

SEMESTER-VIII

Course Code	Name of Course	Teaching Scheme				Examination Scheme				Total Marks
		L	T	P	H	DD	PA	TR	SR	
CN 801	Civil Construction Training-II	0	0	30	30	50	50	50	50	Grade
	Total	**0**	**0**	**30**	**30**	**50**	**50**	**50**	**50**	**Gr.**
For Training DD - Daily Dairy, PA - Progressive Assessment, TR – Training Marks, SR-Seminar										

(CN 801) CIVIL CONSTRUCTION TRAINING II

1. COURSE OBJECTIVES:

The students will able to Acquire knowledge of different terms, concepts and methods employed at a construction site, Develop the ability to apply basic methods to solve site problems and Execute management plans with precision. Acquire sufficient techniques necessary for daily construction office works

2. TEACHING AND EXAMINATION SCHEME

Semester **VIII**						
Course Code & Title		**Theory**		**Practical**		**Total**
		Daily diary	**P A**	**Training Report**	**Seminar**	
CN 801		50	50	50	50	Grade
Civil Construction Training - II	**Total**	**50**	**50**	**50**	**50**	**Grade**

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO801.1. Understand, and Demonstrate ability to manage and supervise a construction site effectively

CO801.2. Apply, engineering knowledge to Practice, construction site and office operations effectively

CO801.3. Analyse, Inspect and Estimate quantities using quantity surveying,

CO801.4. Propose, Organize and Manage, appropriate solutions to construction site and office problems

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Devlopment of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society,Sustain ability & Environment	Project Management	Life -long Learning
CO801.1.	3	2	2	-	-	3	2
CO801.2.	3	2	2	2	2	3	3
CO801.3.	3	2	2	2	-	3	2
CO801.4.	3	3	3	3	2	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
	Construction Planning and Practice	Construction Management and Design
CO801.1.	3	3
CO801.2.	3	3
CO801.3.	3	3
CO801.4.	3	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	**TH = Teaching hours**	**CO = Course Objectives**				
UNIT			**M**	**TH**	**CO**	**BL**
1 SITE DUTIES						
Students are expected to perform most of the following jobs/assignments/activities during the training period. 1. Fixing site layout/site rail. 2. Marking centreline of column/walls. 3. Carry out masonry operations. 4. Carry out earthwork and rubble packing operations. 5. Carry out concreting operations. 6. Check steel reinforcements in RCC : footings, Columns, beams, slabs, 7. Check structural form-work for shape, size and stability. 8. Call/order for materials. 9. Store the materials. 10. Carry out testing for different jobs. 11. Carry out and record Measurements 12. Prepare Measurement sheet and Abstract sheet. For running and final bill 13. Billing/labour payments. 14. Maintain daily records. 15. Regularly check the schedule and take corrective measures. 16. Carry out flooring works. 17. Carry out painting works. 18. Check electrical works 19. Water-proofing. 20. Carry out and Check Sanitary filling/pipes/internal plumbing works. 21. Temporary services for labour/safety. 22. Carry out Maintenance and Repairs works. 23. Carry out any additional works entrusted to them in relation to the site (interaction with other authorities, banking etc.)			50	Full day	all	all
2 OFFICE DUTIES						
Students are expected to perform most of the following jobs/assignments/activities during the training period. 1. Carry out and record Measurements 2. Prepare and check Measurement sheet and Abstract sheet. For running and final bill 3. Billing & payments. 4. Maintain office records. 5. Regularly check the schedule and take corrective measures. 6. Prepare Drawings and blue prints. 7. Assist in Building Design. 8. Use Office software (if given) effectively 9. Carry out any additional works entrusted to them (interaction with other authorities, interaction with Site personnel, banking, inventory etc.)			50	Full day	all	all

Total	**100**			

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	**Unit**	**Number of lectures**	**Marks**
1	Site duties.	-	50
2	Office duties.	-	50
	Total		100

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

Intellectual Skill:

- Acquire knowledge of different terms and, concepts employed at a construction site
- Develop the ability to solve construction problems
- Acquire techniques necessary for daily construction office works
- Inspect and Evaluate construction works
- Supervise the building construction activities

Motor Skills:

- Prepare report on training.
- Execute site management plans
- Estimate labour and material requirement for next day's work
- Develop public speaking ability

No	**Practical**	**Marks**
	DAIRY AND REPORT ASSESSMENT	**50**
1	The daily dairy shall be signed by the partner/owner/manager/representative of employer every day. If reporting at Institute officially then HODs sign is necessary for that day. The Daily-dairy and Report prepared shall be assessed by the internal examiner/teacher during PA.	
2	**PROGRESSIVE ASSESSMENT-**	50
	The assessment will be done periodically at least three times during training by the teachers in consultation with the industry/trainer.	
	ORALS/VIVA ASSESSMENT -	100
	The appointed examiner shall assess the trainee based on their reports and performance in oral/viva. Marks should be given to his presentation, Confidence, engineering skills, managerial skills and knowledge gained in performing job activities	
	Total	200
All the students undergoing training should submit- Daily dairy and Training report		

	Daily dairy-	
	The daily dairy should-be maintained in a bound book. It should reflect the day-to-day activities performed by the student (including task, men, materials safety and procedures involved). It should be counter signed by the Sr. Engineer. It will become the basis for writing reports on the complete training. Based on daily dairy students will be able to work out Task work, rate of different items and compare them with market rates and Goa schedule of rates	
	Training Report -	
	2.1 INTRODUCTION The training report should be submitted by the training students should include the following salient points- Certificate from institute, Certificate of training from company, detailed write up as per daily dairy, detailed drawings, working drawings, photographs, safety precautions, techniques for work minimization on site, organizational chart, Importance of project to the society, special methods/techniques/equipment should be separately heightened, environmental aspects. The report should be informative and technical, typed with double spacing on good quality bond paper and bound. Assessment of Training Report be based on Knowledge, Presentation, Quality of contents and Sketches.	
	2.2 REPORT The report shall be in the following format: 1. Synopsis (brief abstract 700 words) 2. Introduction to Company and Site/Office and company structure 3. Role of individual at company/site 4. Work supervised/done e.g. –, plastering, concreting, excavation, waterproofing ..... (min 4 including special works if any) 4.1, Introduction _general description of work from text book 4.2, check list for materials used on site (quantities of cement, lime, aggregates, sand, props, scaffolding stones, water, dowels, string,) 4.3, check list for tools used on site number and type 4.4, check list for labour used on site number and type (mason, fitter, bender, helper, MC, FC...) 4.5, Do-list for work as per textbook (procedure/steps in list form) 4.6, Do-list for work followed on site (procedure/steps in list form) 4.7, Safety precautions taken on site 8. What did I learn? 9. Conclusion 10. Bibliography and references	

	2.3 OTHER PAGES IN REPORT Front page with institute logo Institute Certificate Training organization Certificate Acknowledgement Contents 1. List of topics 1.1. sub topic 1.1. sub topic 1.1. sub topic 2. List of figures and photo graphs 3. List of tables 4. List of drawings/plans References Appendices (plans/ Rates/ ...)	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Civil Dept	Draft of training report	CT Dept APV
2	Civil Dept	Draft of training presentation PPT	CT Dept APV
3	Civil Dept	Daily Dairy	APV

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	B.N. Datta	Estimating & Costing In Civil Engineering	UBS Publishers
2	W. B. Mackay	Building Construction Vol. I to IV	Longman (ELBS)
3	B. C. Punmia	Building Construction	Laxmi Publication

Indian and International codes needed

S. No.	Author	Title of Books	Publishers
1	IS 1200	Method of Measurement of building and Civil engineering works	BIS